

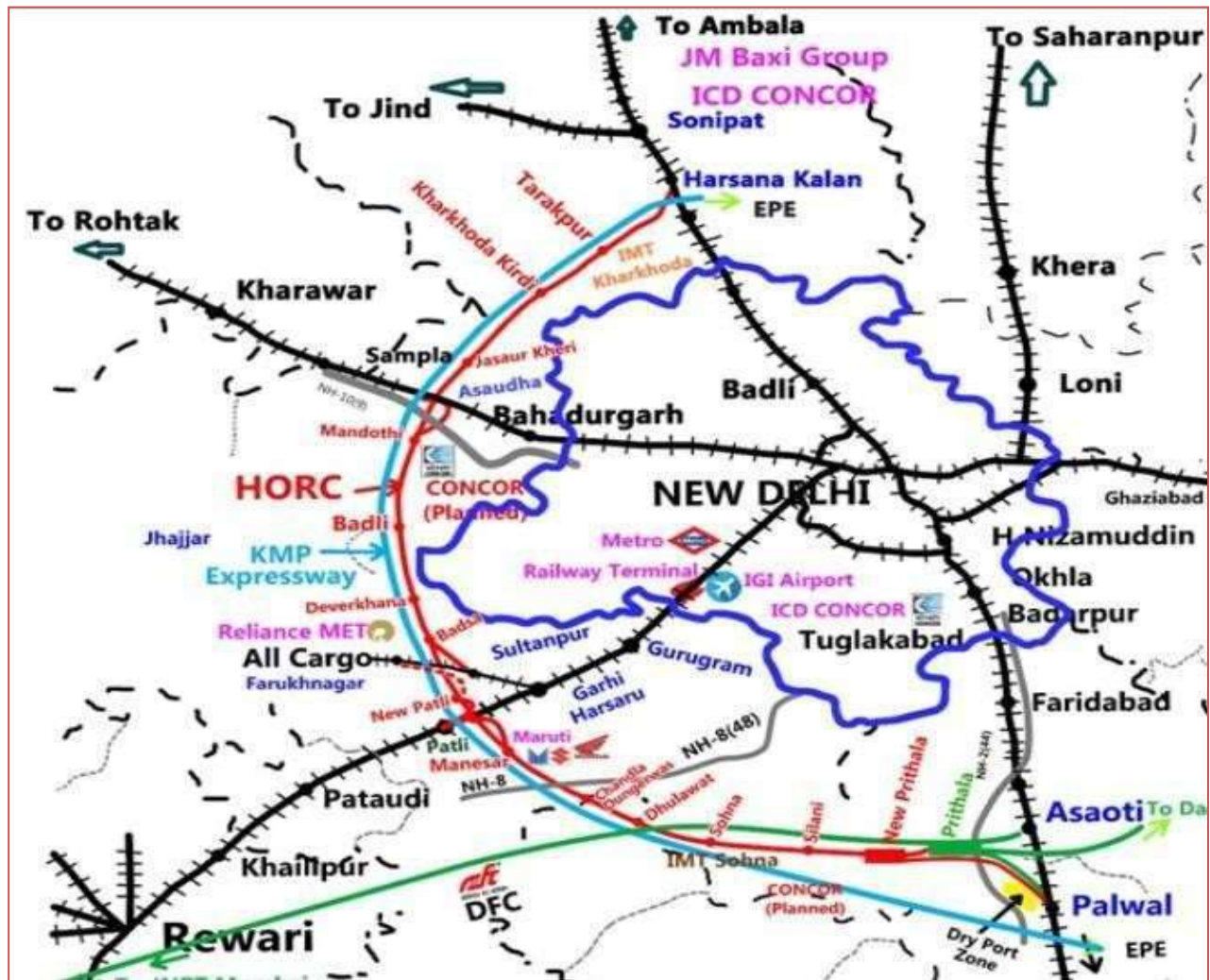


HARYANA RAIL INFRASTRUCTURE DEVELOPMENT CORPORATION LTD

(A Joint Venture of Government of Haryana and Ministry of Railways)

ENVIRONMENT & SOCIAL IMPACT ASSESSMENT

for Haryana Orbital Rail Corridor (HORC) project (143.93 Km) from Palwal to Sonipat including connections to the existing railway network



March 2022



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TABLE OF CONTENT

S.No.	PARTICULAR	PAGE NO.
EXECUTIVE SUMMARY		XXIV-XXVIII
1.0	Background	
2.0	Objectives of the Project & ESIA study	
3.0	Description of Project	
4.0	Key Laws and Regulations	
5.0	Baseline Data	
6.0	Environmental and Social Impacts	
7.0	Public Consultation and Disclosure	
8.0	Grievance Redress Mechanism	
9.0	Analysis of Alternatives	
10.0	Environmental and Social Management Plan	
11.0	Summary and Conclusion	
Chapter 1: INTRODUCTION		1-13
1.1	Background	
1.2	Haryana Rail Infrastructure Development & Corporation (HRIDC)	
1.3	Objective of ESIA and ESMP	
1.4	Scope of ESIA Study	
1.5	Approach and Methodology for ESIA Study	
	1.5.1 Environmental Impact Assessment	
	1.5.2 Social Impact Assessment	
1.6	Structure of Report	
Chapter 2: PROJECT DESCRIPTION		14-45
2.1	Introduction	
2.2	Traffic Demand forecast	
	2.2.1 Traffic Estimate	
2.3	Need of the Project	
2.4	Expected Positive Impact of Project	
2.5	Project Location	
	2.5.1 Serving Station and Connectivity to Existing IR Network	
	2.5.2 Transportation Map of 10 km buffer zone of study area	
2.6	Salient Features of the Projects	
2.7	Land Requirement	
2.8	Water Requirement	
2.9	Quantity of Soil Requirement	
2.10	Requirement of Construction Material	
2.11	Manpower Requirements	
2.12	Power Requirement	
2.13	Basis of Design	
2.14	Civil Engineering Structures and Works	
	2.14.1 Formation In Filling/Cutting	
	2.14.2 P. Way	
	2.14.3 Tunnels	
	2.14.4 Bridges	
	2.14.5 Stations, Staff Quarters, Supervisory & Administrative offices	
	2.14.6 Signaling and Telecommunication System	
	2.14.7 Cost Estimate	
2.15	Financial & Implementation Aspects of the Project	
2.16	Implementation Schedule and Packaging Details	
Chapter 3: LEGAL POLICY AND REGULATORY FRAMEWORK		46-79
3.1	Introduction	

S.No.		PARTICULAR	PAGE NO.
3.2		Government of India's Requirements	
3.3		Applicable National Environment Policies and Regulations	
	3.3.1	The Environment (Protection) Act, 1986	
	3.3.2	EIA Notification, 2006	
	3.3.3	The Indian Forest Act, 1927	
	3.3.4	Forest Act and Its Amendments	
	3.3.5	The Biological Diversity Act, 2002 and its Rules, 2007	
	3.3.6	The Wildlife (Protection) Act, 1972 and its Amendment, 2003	
	3.3.7	Noise Pollution Regulation and Control Rules, 2000	
	3.3.8	Air (Prevention and Control of Pollution) Act, 1981	
	3.3.9	Water (Prevention and Control of Pollution) Act, 1974	
	3.3.10	Ancient Monuments & Archaeological Sites & Remains (Amendment and Validation) Act 2010	
	3.3.11	Cultural Environment Related Act, 1958	
	3.3.12	Regulation / Act Governing Vibration	
	3.3.13	Public Liability Insurance Act, 1991 and Its Amendment, 1992	
	3.3.14	National Green Tribunal Act, 2010	
	3.3.15	Labour Laws	
	3.3.16	The National Environmental Policy (NEP) 2006	
	3.3.17	National Forest Policies	
	3.3.18	Hazardous Wastes (Management, Handling and Trans-Boundary Movement) Rules, 2008 and Its Amendments	
	3.3.19	MOEF Eco-Sensitive Area Notifications	
	3.3.20	Tree felling Procedures in Haryana	
3.4		environment Clearance requirement for the Project	
3.5		Applicable Environmental International Treaties and Standards	
3.6		Applicable Laws and Policies for SIA	
	3.6.1	Railways act 1989	
	3.6.2	Right to fair compensation and transparency in Land Acquisition, Rehabilitation & Resettlement Act 2013	
	3.6.3	Right to fair compensation and transparency in Land Acquisition, Rehabilitation & Resettlement (Haryana Amendment) Act 2017	
	3.6.4	Railways Circular No. E (NG) II.2010.RC-5/1 dated 11.11.2019	
	3.6.5	State Government Order/Notifications	
	3.6.6	Other Relevant Acts and Policies	
3.7		Asian Infrastructure Investment Bank (AIIB) Guidelines for Environmental and Social Framework February 2016	
3.8		Institutional Framework for Environment Management	
	3.8.1	At Indian Level	
	3.8.2	At State Level	
Chapter 4: DESCRIPTION OF ENVIRONMENT (BASELINE ENVIRONMENTAL DATA)			80-194
4.1		General	
4.2		Methodology- Baseline Monitoring/ Data	
	4.2.1	Study Area	
	4.2.2	Study Period	
4.3		Secondary Data Collection	
	4.3.1	Physiography	
	4.3.2	Geology	
	4.3.3	Natural Resources	
	4.3.4	Climate	
	4.3.5	Seismicity	

S.No.		PARTICULAR	PAGE NO.
	4.3.6	Land Use Pattern of Project Districts	
	4.3.7	Water Resources	
	4.3.8	Biodiversity	
	4.3.9	Religious and Cultural Heritage sites	
4.4		Primary Baseline Data Collection	
	4.4.1	Remote sensing and GIS Application	
	4.4.2	Land Use of Study Area	
	4.4.3	Site Analysis	
	4.4.4	Summary of LULU for Rail Route and Stations	
4.5		Water Environment	
	4.5.1	Water Quality of the project area	
	4.5.2	Groundwater Monitoring Locations	
	4.5.3	Surface Water Monitoring Locations	
4.6		Ambient Air Environment	
	4.6.1	Air Quality	
4.7		Noise Environment	
	4.7.1	Noise Monitoring Locations	
	4.7.2	Results of Ambient Noise Monitoring	
4.8		Soil Analysis	
	4.8.1	Objectives	
	4.8.2	Soil Sampling Locations	
	4.8.3	Soil Monitoring Results	
	4.8.4	Interpretation of the Analytical Reports	
4.9		Vibration Monitoring	
	4.9.1	Monitoring Locations for Vibration Analysis	
4.10		Biodiversity	
	4.10.1	Floristic Composition	
	4.10.2	Fauna and Avi-Fauna	
	4.10.3	Amphibian	
	4.10.4	Agricultural & Horticultural Crops of the Study Area	
	4.10.5	Tree cutting Details	
	4.10.6	Critical Habitat Assessment using IFC Criteria	
	4.10.7	Sensitive Receptors Along the Proposed Alignment	
	4.10.8	Environmental Sensitive Areas Along The Proposed Alignment	
	4.10.9	Environment Features	
	4.10.10	Overall Observation and Interpretation	
4.11		Socio-Economic Environment	
	4.11.1	Overview of Haryana State	
Chapter 5: ANTICIPATED ENVIRONMENTAL IMPACT			195-247
5.1		Background	
5.2		Environmental Impacts During Pre-Construction Stage	
	5.2.1	Change of Land Use	
	5.2.2	Clearing the Ground for construction activity	
	5.2.3	Establishment of Labour Camps	
	5.2.4	Setting Up the Ready mix concrete plant	
	5.2.5	Utility/ drainage problem	
	5.2.7	Access control and Barricading	
	5.2.8	Impact Due to Power Infrastructure	
5.3		Environmentnal Impact During Construction Stage	
	5.3.1	Soil Erosion	
	5.3.2	Impact on Geology	

S.No.		PARTICULAR	PAGE NO.
	5.3.3	Construction of New bridge and culverts	
	5.3.4	Collection of Construction Material	
	5.3.5	Excavation, Loading and unloading of Construction Material	
	5.3.6	Quarries and Borrow Area	
	5.3.7	Contamination of Soil	
	5.3.8	Impact on Water Quality	
	5.3.9	Storage, handling and Disposal of Solid, Hazardous and C&D Waste	
	5.3.10	Risk due to Natural Hazards	
	5.3.11	Impact due to Climate Change	
	5.3.12	Operation of Construction Equipments	
	5.3.13	Vibration Impacts and Risk to Existing Buildings	
	5.3.14	Traffic Diversions	
	5.3.15	Occupational Health & Safety of Labour	
	5.3.16	Impact due to Tunnel Construction	
	5.3.17	Noise and Vibration Impact due to Tunnel Construction	
	5.3.18	Impact due to Generation and Disposal of Spoil	
5.4		Environmental Impact due to Project Operation	
	5.4.1	Right of way, Alignment and Architecture	
	5.4.2	Operation of Train	
	5.4.3	Operation of Stations	
5.5		Positive Impacts	
	5.5.1	Employment Opportunities	
	5.5.2	Reduction of Traffic and Green House Gas Saving	
5.6		Impact Matrix	
5.7		Cumulative Impact	
5.8		Social Impacts	
Chapter 6: INFORMATION DISCLOSURE AND PUBLIC CONSULTATION			248-270
6.1		General	
6.2		Objectives	
6.3		Stakeholder in HORC Project	
6.4		Method of the Public Consultations	
6.5		Consultation During ESIA Stage	
6.6		Consultations conducted in Project Affected Districts	
6.5		Target Area	
6.6		Coordination of Stakeholder Meeting (SHM's) and Methodology	
6.7		Consultations With Women	
6.8		Consultation with Vulnerable Group	
6.9		Summary of Consultation	
6.10		Safeguards Documents Disclosure	
Chapter 7: STAKEHOLDER ENGAGEMENT PLAN			
7.1		Background	271-281
7.2		Proposed Stakeholder Engagement Program	
7.3		Proposed Strategy for Information Disclosure	
7.4		Proposed Strategy to Incorporate the View of Vulnerable Groups	
7.5		Resources and Responsibilities for Implementation Planned SEP Activities	
7.6		Budget	
Chapter 8: GRIEVANCE REDRESS MECHANISM (GRM)			282-287
8.1		Introduction	
8.2		Grievance Redressal Committee (GRC)	
8.3		Procedure to Redress Grievance	
8.4		Project Affected Peoples Mechanism	

S.No.		PARTICULAR	PAGE NO.
8.5		Monitoring and Evaluation	
8.6		Grievance Redressal by Contractor	
8.7		AIIB Policy Description	
8.8		Contact Person For GRM	
Chapter 9: RESETTLEMENT POLICY FRAMEWORK			288-298
9.1		Background	
9.2		Applicable Laws and Policies	
9.3		Entitlement Matrix	
9.4		Land Transfer and Acquisition	
Chapter 10: ENVIRONMENT AND SOCIAL MANAGEMENT AND MONITORING PLAN			299-373
10.1		Introduction	
10.2		Basic Approach of Environment Management Plan	
	10.2.1	Objectives of Environmental Monitoring	
10.3		Structure of Environmental Management Plan	
10.4		Pre-Construction Stage (Location and Design Phase)	
	10.4.1	Alignment	
	10.4.2	Loss of Water Bodies	
	10.4.3	Design Provision for Safety of Structure against earthquake, fire and flood	
	10.4.4	Archeological Monument	
	10.4.5	Utility Diversion	
	10.4.6	Compensatory Afforestation Plan	
10.5		Construction Stage	
	10.5.1	Construction Material Management and Housekeeping	
	10.5.2	Pre-casting Yard and Material Stockpiling	
	10.5.3	Air Pollution and Dust Suppression Plan	
	10.5.4	Noise and Vibration Reduction Plan	
	10.5.5	Debris Disposal Plan	
	10.5.6	Borrow Area Management Plan	
	10.5.7	Solid and Liquid Waste Management Plan	
	10.5.8	Hazardous Waste management Plan	
	10.5.9	Construction and Demolition Waste Management Plan	
	10.5.10	Soil Contamination prevention plan	
	10.5.11	Labour Camp	
	10.5.12	Welfare of Labour on Construction Site	
	10.5.13	Safety Plan for Health and Hygiene of Construction worker	
	10.5.14	Human Health and Hygiene Management During Construction	
	10.5.15	HIV/AIDS Prevention Plan in and around construction Camp	
	10.5.16	Conservation Plan for Peafowl	
	10.5.17	Erosion Control Plan	
	10.5.18	Water Pollution Prevention Plan	
	10.5.19	Traffic Diversion Management	
	10.5.20	Biodiversity Management Plan	
	10.5.21	Construction Site Monitoring Plan	
10.6		Operation Phase	
	10.6.1	Temporary Land Acquisition	
	10.6.2	Noise	
	10.6.3	Soil Erosion	
	10.6.4	Vibration	
10.7		Environment Monitoring Plan	
	10.7.1	The Need	

S.No.		PARTICULAR	PAGE NO.
	10.7.2	Environment Monitoring	
10.8		Implementation Arrangements	
10.9		Capacity Building	
10.10		Summary of the EMP Budget	
10.11		Social Management Plan	
10.12		Scoail Budget	
10.13		Reporting System	
10.14		Risk Assessment and Disaster Management Plan	
	10.14.1	Disaster Management	
	10.14.2	Purpose of Disaster Management Plan	
	10.14.3	Objectives of Disaster Management Plan	
	10.14.4	Provision Under Disaster Management Act, 2005	
	10.14.5	Command & Control At The National, State & District Level	
	10.14.6	Institutional Mechanisms in Haryana	
	10.14.7	Institutional Mechanism at District Level	
	10.14.8	Integrated Command System of Railways with Integrated Operation Centre of MHA	
	10.14.9	Standard Operating procedure to be followed at the time of disaster	
	10.14.10	Disaster Risk Management	
	10.14.11	Emergency Management Plan	
Chapter 11: ANALYSIS OF ALTERNATIVES			374-381
11.1		Background and Approach	
11.2		With or Without Project	
	11.2.1	Option 1: No Developmental Alternative (Without Project)	
	11.2.2	Option 2: With Project	
11.3		Conceptualization of Alignment	
	11.3.1	Design Alternative for project	
11.4		Analysis of Alternatives Technologies	
	11.4.1	Environment Benefit and Dis benefit of various Tunneling Method	382-383
Chapter 12: SUMMARY & CONCLUSIONS			
12.1		Introduction	
12.2		Key Findings of the Study	
12.3		Recommendations	

LIST OF TABLES

TABLE	CONTENT	Page No.
Table 1.1	Approach and Methodology for SIA	
Table 2.1	Proposed stations with chainages for HORC Project	
Table 2.2	Total Potential Passenger Trips Along the Corridor in Immediate Influence Area	
Table 2.3	Total Passengers Travelling by Rail on Proposed Rail Corridor For Horizon Year	
Table 2.4	Total Passenger trains for the horizon years	
Table 2.5	Land requirement	
Table 2.6	Water Requirement During Construction Phase	
Table 2.7	Water Requirement During Operation Phase	
Table 2.8	Details of Construction Material Required for Proposed HORC Project	
Table 2.9	Bridge and Waterways Proposed in the Project Alignment	
Table 2.10	Overall Capital Cost for Haryana Orbital Rail Corridor (HORC)	
Table 2.11	Packaging Details for Proposed HORC Project	
Table 3.1	Acts, Rules, Policy and Guideline	
Table 3.2	Applicable Permits and Clearances Required for the Project	
Table 3.3	Applicable International Treaties and Standards	
Table 3.4	Main Elements of the Railway Act, 1989	
Table 3.5	Multiplying Factor for Concerned DLC Rates	
Table 3.6	Applicable Policy and Standard of AIIB	
Table 3.7	Comparison between AIIB Policy, Laws Governing Land Acquisition, and HRIDC RPF	
Table 4.1	Soil type of project area	
Table 4.2	Temperature and Rainfall status of Project districts	
Table 4.3	Land Use pattern of Project Districts (hac)	
Table 4.4	Ground Water Resources of project Districts, 2009 (in mcm)	
Table 4.5	Ground Water Resources Assessment, 2017	
Table 4.6	District-wise depth of water Pre-monsoon 2019	
Table 4.7	Location of Canal & Drain crossing the Proposed Alignment	
Table 4.8	Details of Major Water Bodies Present in the Districts	
Table 4.9	District- wise Forest Cover (in sq km) in project area	
Table 4.10	District- wise Reserved forest and Protected forest Cover (in ha)	
Table 4.11	Reserved and Protected forest closest to the proposed Alignment	
Table 4.12	Detail of Chainage wise Forest Land (in Ha) in HORC Project	
Table 4.13	Checklist of Birds in Sultanpur National Park	
Table 4.14	District Wise Major religious and Cultural Heritage Sites	
Table 4.15	Archeological Sites/monuments within 10 Km Buffer of proposed alignment	
Table 4.16	Land Use and Land Cover Break Up	
Table 4.17	Water Testing Methodology	
Table 4.18	Sampling location for Groundwater	

TABLE	CONTENT	Page No.
Table 4.19	Groundwater Monitoring Results	
Table 4.20	Surface water Monitoring Locations	
Table 4.21	Surface Water Monitoring Results	
Table 4.22	Sampling locations for ambient air quality	
Table 4.23	Ambient Air Quality Monitoring Results along the route	
Table 4.24	Sampling locations for Noise quality	
Table 4.25	Ambient Noise Monitoring Results	
Table 4.26	Sampling locations for soil quality	
Table 4.27	Analysis Methodology of Soil Samples	
Table 4.28	Soil Sampling Results Along the Rail Route.	
Table 4.29	Standard Soil Classification	
Table 4.30	Vibration Level along the Existing Railway Tracks	
Table 4.31	Floristic Composition of Study Area on the Basis of Classified Groups	
Table 4.32	Habit-wise Floristic Composition of Study Area	
Table 4.33	List of Plant species recorded from study area (Core zone)	
Table 4.34	List of Plant species recorded from study area (Buffer zone)	
Table 4.35	Diversity of Fauna (Mammals) in the Study Area	
Table 4.36	Diversity of Avi-fauna (Bird) in the Study Area	
Table 4.37	Agriculture crop of the project districts	
Table 4.38	Detail of Tree Census for Proposed HORC Project	
Table 4.39	Sensitive Receptors along 10 Km Radius on each side from proposed alignment.	
Table 4.40	List of Reserved and Protected Forest Closest to the Proposed Alignment	
Table 4.41	Environment Features nearby the Proposed HORC Alignment	
Table 4.42	Summary of Socio-Economic Indicators	
Table 4.43	Sex Distribution of Project Affected Persons	
Table 4.44	Age Group of Project Affected Persons	
Table 4.45	Distict Wise Size of the Household	
Table 4.46	Marital Status in Project Affected Households	
Table 4.47	Religion Status of Project Affected Households	
Table 4.48	social Stratification of PAH	
Table 4.49	Education Status of Project Affected Persons	
Table 4.50	Occupation of Project Affected Persons	
Table 4.51	Number of Earning Members in PAH	
Table 4.52	District Wise Number of Dependent Members in PAH	
Table 4.53	Monthly Income of the Project Affected Households	
Table 4.54	Monthly Average Expenditure of the Households	
Table 4.55	Basic AMenitis and Assets of PAH	
Table 4.56	Gender Decision Making and Participation	
Table 4.57	Access to Public Service Facilities	
Table 4.58	Perceived Benefits About HORC Project	
Table 4.59	District Wise Resettlement and Rehabilitation Option	
Table 5.1	Tree to be felled (within RoW)	
Table 5.2	Chainage wise detail of Forest Land (in ha) in HORC Project	

TABLE	CONTENT	Page No.
Table 5.3	Input data for Construction Site at Proposed Station	
Table 5.4	Incremental Value at Proposed Station Locations During Construction Phase	
Table 5.5	Predicted Value at Monitoring Location During Construction Phase	
Table 5.6	Noise Level Prediction During Construction db(A)	
Table 5.7	Average Noise Levels Generated by Operation of Various Construction Equipment	
Table 5.8	Guideline Vibration Damage Threshold Criteria	
Table 5.9	Vibration source level of Construction Equipment	
Table 5.10	Estimated Vibration Level for different construction equipment	
Table 5.11	Vibration Impact Table	
Table 5.12	Train Operation plan for Noise prediction	
Table 5.13	Noise at Sensitive structure (2027)	
Table 5.14	Predicted Vibration Level due to Project without Control measures	
Table 5.15	Recommended Criteria for Ground- Borne Vibration & ground Borne Noise for General Assessment	
Table 5.16	Green House Saving	
Table 5.17	Rating of Environmental Impacts	
Table 5.18	Impact Identification Matrix	
Table 5.19	Numerical Scores Range for Impact Rating	
Table 5.20	Environmental Impact Matrix	
Table 5.21	Cumulative Impact Chart	
Table 5.22	Potential Impact and Mitigation Measures	
Table 5.23	District Wise Social Impacts of the Project	
Table 5.24	District Wise Details of Land to be Acquired	
Table 5.25	District Wise Number of PAHs and PAPs (Title Holders)	
Table 5.26	District Wise Number of PAHs (Non-Title Holders)	
Table 5.27	District Wise Land Holding Size of PAH	
Table 5.28	District Wise Structures Impacted	
Table 5.29	Typology and Area of the Structures Impacted	
Table 5.30	District Wise Magnitude of impact on Structure	
Table 5.31	Type of Public Amenities/Community Structures	
Table 5.32	Cost of Kharif and Rabi Crops on Private Land for One Year	
Table 5.33	District Wise Trees Impacted	
Table 5.34	Impact on Vulnerable Households	
Table 5.35	Summary of Social Impacts	
Table: 6.1	Key Stakeholder with Interest in HORC Project	
Table: 6.2	Consultations Held in th Five Districts	
Table: 6.3	Summary of Consultations with Project Affected Women	
Table: 6.4	Summary of Consultation with Project Affected Vulnerable Group	
Table 6.5	Summary of Consultations	
Table 7.1	Stakeholder Group With Interest in HRIDC	
Table 7.2	Haryana Orbital Rail Project Stakeholder Engagement Methods	
Table 7.3	HORC Project Strategy for Stakeholder Engagement	
Table 7.4	Estimated Annual Cost of SEP	
Table 8.1	Grievance Redress Committee- Site & HQ Level	

TABLE	CONTENT	Page No.
Table 9.1	The First Schedule: Compensation for Land and Value of Assests Attached to Land or Building	
Table 9.2	The second Schedule: Resettlement and Rehabilitation Assistant for Project Affected People	
Table 10.1	Cost estimate for Debris Disposal Plan	
Table 10.2	List of Hospitals in 10 Km Buffer Zone	
Table 10.3	Estimated Budget for Environmental monitoring plan for 5 year (Construction Phase)	
Table 10.4	Summary of EMP Budget	
Table 10.5	Environment Monitoring Plan- Design, construction and operation	
Table 10.6	Social Impact Management Plan- Design, Construction and Operation	
Table 10.7	Social Cost Estimates	
Table 10.8	Reporting System During Construction And Operation Phase	
Table 10.9	Members of Haryana State Disaster Management Authority	
Table 10.10	Details of DMP of District through which HORC alignment passes	
Table 10.11	Risk Matrix	
Table 10.12	Activities During Construction along with Mitigation Measures	
Table 11.1	Comparison of Original Alignment and Final Alignment	
Table 11.2	Summary Of Environmental Benefit And Dis- Benefit Of Various Tunneling Method	

LIST OF FIGURES

FIGURE	CONTENT	Page No.
Figure 2.1	Districts from which proposed HORC alignment passes	
Figure 2.2	Key Plan of Proposed Rail Corridor	
Figure 2.3	Accessible National and State Highway Roads From proposed HORC Project	
Figure 4.1	Minerals Map of Haryana	
Figure 4.2	Wind speed and Direction of Gurugram	
Figure 4.3	Wind speed and Direction of Jhajjar	
Figure 4.4	Wind speed and Direction of Nuh	
Figure 4.5	Wind speed and Direction of Palwal	
Figure 4.6	Wind speed and Direction of Sonipat	
Figure 4.7	Earthquake hazard map of Haryana	
Figure 4.8	Water depth for five districts of Proposed Project	
Figure 4.9	Location of Canal and Drain crossing the proposed HORC Alignment	
Figure 4.10	Forest Cover Map of Haryana	
Figure 4.11	Reserved and Protected forest closest to the proposed Alignment	
Figure 4.12 (A)	Map showing National Parks and Wildlife Sanctuaries of Haryana State with proposed HORC alignment (Source: ENVIS, WII)	
Figure 4.12 (B)	Map showing Eco-sensitive zone of Sultanpur National Park and proposed HORC alignment	
Figure 4.13	Satellite Imaginary of Proposed stretch from Palwal to Sonipat	
Figure 4.14	LU and LC Map of Proposed stretch from Palwal to Sonipat	
Figure 4.15	Ground water sampling locations near to Proposed HORC Alignment	
Figure 4.16	Surface water sampling locations near to Proposed HORC Alignment	
Figure 4.17	Sampling locations for ambient air quality w.r.t HORC alignment	
Figure 4.18	Sampling locations for soil quality w.r.t Proposed HORC alignment	
Figure 4.19	Sampling locations for Vibration w.r.t Proposed HORC alignment	
Figure 4.20	Child Labour in Haryana	
Figure 5.1	Incremental value for PM _{2.5}	
Figure 5.2	Incremental Value For PM ₁₀	
Figure 5.3	Incremental Values for SO ₂	
Figure 5.4	NO ₂ Incremental GLC for all station	
Figure 5.5	Incremental value for CO	
Figure 7.1	Organisation Structure of ESMU	
Figure 8.1	Grievance Redressal Procedure	
Figure 10.1	Typical Debris from Project Site	
Figure 10.2	Implementation Arrangement	
Figure 10.3	Institutional Arrangement for ESMP Implementation	
Figure 10.4	Legal Institutional Framework for Disaster Management (Disaster Management Act, 2005)	
Figure 10.5	The Incidence Response System at District Level	

FIGURE	CONTENT	Page No.
Figure 10.6	Schematic Flow Chart for Emergency Management	
Figure 11.1	Alignment Map of HORC	
Figure 11.2	Alternative alignment between Chainage 14000 to Chainage 290 (Tunnel Location)	
PLATE	CONTENT	PAGE NO.
2.1	View of the Study Area	
4.1	Archeological sites/ Monuments within 10 Km Buffer of the proposed Alignment	
4.2	Photograph of Water Sample Collection	
4.3	Photograph of Air Monitoring for the Month of December 2020	
4.4	Photograph of Air Monitoring for the Month of January 2021	
4.5	Photograph of Air Monitoring for the Month of February 2021	
4.6	Plant Diversity of Study Area	
4.7	Photograph of Mammals of the Study Area	
4.8	Photograph of Avi Fauna of Study Area	
4.9	Agriculture field and Forest of Study Area	

LIST OF ANNEXURES

Annexures No.	Content
1.1	Letter of Acceptance
1.2	Term of References
1.3	Methodology for baseline data collection
1.4	Questionnaires for Census and Socio-economic Survey
1.5	Format for Public Consultation
2.1	Key plan
2.2	Typical Double Line Cross Section
2.3	Power Infrastructure & Electrical Engineering Work
2.4	Tunnel detail
2.5	Bridge List
2.6	Typical Station Building Design
2.7	Component of Signaling, Operation and Maintenance
2.8	Implementation Schedule
4.1	Migratory Route of Bird & Census of Bird for Sultanpur National Park
4.2	Archeological Survey of India (ASI) Site, sensitive receptor, hospitals & structure detail affected due to HORC alignment
4.3	Strip Map/plan
4.4	Detail Lab Report for Air, Noise, Water and Soil
4.5	Hourly Noise Data
4.6	Tree to be cut for Proposed Alignment
5.1	Climate Risk & Vulnerability Assessment
5.2	Station Wise Incremental GLC
5.3	Village – wise detail of land to be acquired for proposed HORC project
5.4	Detail of structure impacted due to proposed HORC project
5.5	Detail of CPR impacted due to proposed HORC project
5.6	Detail of Cost for agriculture crops
5.7	Village – wise detail tree to cut
6.1	Initial stakeholder consultation
6.2	Permission for Public Consultation from Commissioner
6.3	Photograph of Public Consultation
6.4	Issue raised during Public Consultation
6.5	List of Stakeholder

ACRONYM

Acronym	Full form
AAQ	Ambient Air Quality
AAQM	Ambient Air Quality Monitoring
AAQS	Ambient Air Quality Standards
AAS/ICPA	Atomic Absorption Spectrophotometer/Inductively Coupled Plasma Analyzer
AIB	Asian Infrastructure Investment Bank
AIS & LUS	All India Soil and Land Use Survey
AMSL	Above Mean Sea Level
ANFO	Ammonium Nitrate - Fuel Oil
APHA	American Public Health Association
APL	Above Poverty Line
BGL	Below Ground Level
BH	Business Head
BIS	Bureau of Indian Standards
BPL	Below Poverty Line
BNHS	Bombay Natural History Society
CA	Competent Authority
CC	Calcium Carbonate
CCA	Cultural Command Area
COL	Corridor of Impact
CPR	Common Property Resources
CCR	Central Control Room
CD Block	Community Development Block
CFM	Cubic Feet per Minute
CGWB	Central Ground Water Board
COVID	Coronavirus Disease
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
cu. m	Cubic meter
CWC	Central Water Commission
dB	Decibel
DFO	District forest officer
DFC	Dedicated Freight Corridor
DFCCIL	Dedicated Freight Corridor Corporation of India Ltd.
DMP	Disaster Management Plan
DTH	Down the Hole
E	East
EAC	Expert Appraisal Committee
EC	Environmental Clearance
ECO	Emergency Coordinating officer
EIA	Environmental Impact Assessment

Acronym	Full form
EMC	Environment Management Cell
E&S	Environment and Social
ESF	Environment and Social Framework
EMP	Environmental Management Plan
EMP	Environmental Monitoring Programme
ESIA	Environment and Social Impact Assessment
ESS	Environment and Social Standard
ENE	East of North East
ESP	Environment and Social Police
EPA	Environmental Protection Act
EPO	Emergency Planning officer
ERDAS	Earth Resources Data Analysis System
ES	Environment and Social
ESE	East of South East
FCC	False Color Composite
FGD	Focus Group Discussion
FPO	Farmer Producer Organization
FPS	Fine Particulate Sampler
FSI	forest Suvey of India
GCP	Ground Control Points
GC	General Consultant
GLC	Ground Level Concentration
GRC	Grievance Redressal Committee
gm/cc	Gram per cubic meter
GoH	Government of Haryana
gm/sec	Gram per second
GoI	Government of India
Govt.	Government
GPS	Global Positioning System
GRM	Grievance Redressal Mechanism
GSI	Geological Survey of India
GWEC	Ground Water Estimation Committee
Ha	Hectare
HEME	Heavy Earth Moving Equipment
HIV	Human Immunodeficiency Virus
HQ	Head Quarter
HOD	Head of Department
HORC	Haryana Orbital Rail Corporation
HP	Horse Power
hr/day	Hour per day
HRIDC	Haryana Rail Infrastructure Development Corporation
HRIDCL	Haryana Rail Infrastructure Development Corporation Limited
IBM	Indian Bureau of Mines
IMD	Indian Meteorological Department
IPPF	Indigenous Peoples Police Framework
IPP	Indigenous People Plan

Acronym	Full form
IR	Indian Railway
IS	Indian Standards
ISO	International Organization of Standardization
IUCN	International Union for Conservation of Nature
JV	Joint Venture
kg	Kilogram
Kg/ha	Kilogram per hectare
Kg/hr	Kilogram per hour
KLD	Kilo Liter Per Day
KLD	Kilo Liter Per Day
Km	Kilometer
KMP	Kundli-Manesar-Palwal
LoA	Letter of Award
LC	Least Concern
LU/LC	Land Use / Land Cover
LA	Land Acquisition
LUS	Land Use Study
m	Meter
Mrl	Meter Reduced Level
M&E	Monitoring and Evaluation
MC	Magnesium Carbonate
mg/l	Milligram per Liter
mcm	million cubic metre
mm	Millimeter
MoEF&CC	Ministry of Environment forest and Climate Change
MSK	Medvedev-Sponheur-Karnik Scale
MOR	Ministry of Railway
MLA	Member of Legislative Assembly
MSL	Mean Sea Level
MT	Million tonnes
MTPA	Million tonnes Per Annum
N	North
NAAQS	National Ambient Air Quality Standards
NABET	National Accreditation Board for Education & Training
NABL	National Accreditation Board for Testing and Calibration Laboratories
NATMO	National Atlas & thematic Mapping Organization
NDIR	Non-Depressive Infrared Spectroscopy
NE	North East
NGO	Non-Governmental Organization
NCR	National Capital Region
NH	National Highway
NNE	North of North East
NRRP	National Rehabilitation and Resettlement Police
NNW	North of North West
NRSA	National Remote Sensing Agency
NRSC	National Remote Sensing Centre

Acronym	Full form
NW	North West
OBC	Other Backward Classes
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Administration
PAF	Project Affected Family
PAH	Project Affected Households
PAPs	Project Affected Persons
PP	Project Proponent
PF	Protected forest
pH	Potential of Hydrogen
PHCS	Public Health Centers
PM	Particulate Matter
PMU	Project Management Unit
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
PWD	Public Work Department
QCI	Quality Council of India
RAA	Railway Amendment Act
RAP	Resettlement Action Plan
RF	Reserved forest
RFCTLAR	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and
R	Resettlement
RoW	Right of Way
RPF	Resettlement Policy Framework
RSPM	Respirable Suspended Particulate Matter
SC	Scheduled Caste
SE	South East
SHE	Safety, Health & Environment
SHE	Safety, Health & Environment
SI	Sustainability Initiatives
SIA	Social Impact Assessment
SoI	Survey of India
SPCB	State Pollution Control Board
SPM	Suspended Particulate Matter
Sq.km	Square Kilometer
SSW	South of South West
ST	Scheduled Tribe
SW	South West
t/hr	tonnes per hour
TC	total Carbonate
TDS	total Dissolved Solids
TNT	Tri Nitro toluene
toR	Terms of Reference
TPD	tonnes Per Day
TRC	Technical Research Cell
TW	Tube Well

Acronym	Full form
UNFC	United Nations Framework Classification
UPA	Urban Planet Atlas
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
VT	Vocational Training
W	West
WHH	Women Headed Household
WNW	West of North West
WSW	West of South West
$\mu\text{g}/\text{m}^3$	Micro gram per meter cube
μm	Micro Meter

DEFINITIONS

Administrator: An officer appointed for the purpose of rehabilitation and resettlement of affected families as mentioned in RFCTLARR 2013.

Affected area: means such area as may be notified by the Government of Haryana under the relevant land **acquisition** acts for the purposes of land acquisition for the Project.

Affected family: Includes—

1. a family whose land or other immovable property has been acquired;
2. a family which does not own any land but a member or members of such family may be agricultural labourers, tenants including any form of tenancy or holding of usufruct right, share-croppers or artisans or who may be working in the affected area for three years prior to the acquisition of the land, whose primary source of livelihood stand affected by the acquisition of land;
3. family whose primary source of livelihood for three years prior to the acquisition of the land is dependent on forests or water bodies and includes gatherers of forest produce, hunters, fisher folk and boatmen and such livelihood is affected due to acquisition of land;
4. a member of the family who has been assigned land by the State Government or the Central Government under any of its schemes and such land is under acquisition;
5. a family residing on any land in the urban areas for preceding three years or more prior to the acquisition of the land or whose primary source of livelihood for three years prior to the acquisition of the land is affected by the acquisition of such land.

Affected Person: Any individual or part of the affected family living, cultivating land or carrying on business, trade or any other occupation along the proposed RoW and who are impacted by the project is a affected person.

Assistance: All supporting mechanisms viz monetary help, extension of services, training of staffs and assets given to PAFs constitute assistance in this project.

Agricultural land: Land used for the purpose of (i) agriculture or horticulture; (ii) dairy farming, poultry farming, pisciculture, sericulture, seed farming breeding of livestock or nursery growing medicinal herbs; (iii) raising of crops, trees, grass or garden produce; and (iv) land used for the grazing of cattle.

Acquired land: means the land acquired under The Railways Act, 1989 or any other prevailing GOs for HORC Project.

Appropriate Government: means, Govt. of Haryana in relation to acquisition of land for HoRC Project.

1. in relation to acquisition of land situated within the territory of, a State, the State Government.
2. in relation to acquisition of land situated within a Union territory (except Puducherry), the Central Government.
3. in relation to acquisition of land situated within the Union territory of Puducherry, the Government of Union territory of Puducherry.
4. in relation to acquisition of land for public purpose in more than one State, the Central Government, in consultation with the concerned State Governments or Union territories; and

5. in relation to the acquisition of land for the purpose of the Union as may be specified by notification, the Central Government.

Provided that in respect of a public purpose in a District for an area not exceeding such as may be notified by the appropriate Government, the Collector of such District shall be deemed to be the appropriate Government.

Authority: The Land Acquisition and Rehabilitation and Resettlement Authority as mentioned in RFCTLARR 2013.

Below Poverty Line or BPL Family: means below poverty line families as defined by the Planning Commission of India from time to time, and those included in the State BPL list in force.

Compensation: refers to the amount paid as compensation under various provisions of the RFCTLARR Act 2013, or the GOs of Govt. of Haryana/Ministry of Railways for private property, structures and other assets acquired for the project, excluding rehabilitation and resettlement entitlements as per this policy.

Collector: The Collector of revenue district, and includes a Deputy Commissioner and any officer specially designated by the appropriate Government to perform the functions of a Collector under RFCTLARR 2013.

Commissioner: The Commissioner for Rehabilitation and Resettlement appointed as mentioned in RFCTLARR 2013.

Cost of acquisition: Includes—

1. amount of compensation which includes solatium, any enhanced compensation ordered by the Land Acquisition and Rehabilitation and Resettlement Authority or the Court and interest payable thereon and any other amount determined as payable to the affected families by such Authority or Court;
 - demurrage to be paid for damages caused to the land and standing crops in the process of acquisition;
2. cost of acquisition of land and building for settlement of displaced or adversely affected families;
3. cost of development of infrastructure and amenities at the resettlement areas;
4. cost of rehabilitation and resettlement as determined in accordance with the provisions of RFCTLARR 2013 Act;
5. administrative cost,
 1. for acquisition of land, including both in the project site and out of project area lands, not exceeding such percentage of the cost of compensation as may be specified by the appropriate Government;
 2. for rehabilitation and resettlement of the owners of the land and other affected families whose land has been acquired or proposed to be acquired or other families affected by such acquisition;
 - cost of undertaking of social impact Assessment study.

Company: means (i) a company as defined in section 3 of the Companies Act, 1956 (1 of 1956) other than a Government company;(ii) a society registered under the Societies Registration Act, 1860 (21 of 1860) or under any corresponding law for the time being in force in a State.

Corridor of Impact (Col): The Corridor of Impact (Col) is the land width required for the actual construction of rail tracks, stations, passenger facilities and amenities, maintenance depot, parking areas, circulation area, storage, overhead equipment, drainage, foot over bridge, miscellaneous items, etc.

Cut- off Date: The Cut-off date for identifying the affected families including land owners, those having title claims recognized under other state and central laws, and squatters shall be the date of first land acquisition (LA) notification issued under 20A of Railway Act,1989 for the Project for which Resettlement Plan is proposed to be prepared.

Displaced family: Any family living, cultivating land or carrying on business or trade or any other occupation within the Corridor of Impact (Col) and are impacted by the project and displaced either physically or economically, is called a displaced family.

Displaced Person: Any individual or part of the displaced family living, cultivating land or carrying on business, trade or any other occupation within the Corridor of Impact (Col) who have been impacted by the project and displaced either physically or economically, is called a displaced person (DP).

Entitled Person: Entitled Person includes all those who qualify for, or are entitled to, compensation/ assistance since being impacted by the project.

Encroacher: Any person illegally occupying public property by extending their land boundary or a portion of their building onto the existing government land or RoW is an encroacher.

Family: Includes a person, his or her spouse, minor children, minor brothers and minor sisters dependent on him:

Provided that widows, divorcees and women deserted by families shall be considered separate families.

Explanation. —An adult of either gender with or without spouse or children or dependents shall be considered as a separate family for the purposes of RFCTLARR 2013;

Household: as defined in RFCTLARR 2013.

Holding of land: The total land held by a person as an owner, occupant or tenant or otherwise;

Infrastructure project: Shall include any one or more of the items specified in clause (b) of sub-section (1) of section 2 of RFCTLARR 2013;

Land: Includes benefits to arise out of land, and things attached to the earth or permanently fastened to anything attached to the earth;

Landless: means such persons or class of persons who may be,

1. considered or specified as such under any State law for the time being in force; or
 - in a case of landless not being specified under sub-clause (i), as may be specified by the appropriate Government.

Land owner: includes any person,-(i) whose name is recorded as the owner of the land or building or part thereof, in the records of the authority concerned; or (ii) any person who is granted forest rights under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (2 of 2007) or under any other law for the time being in force; or (iii) who is entitled to be granted Patta rights on the land under any law of the State including assigned lands; or (iv) any person who has been declared as such by an order of the court or Authority.

Local authority: includes a town planning authority (by whatever name called) set up under any law for the time being in force, a Panchayat as defined in article 243 and a Municipality as defined in article 243P, of the Constitution of India.

Marginal farmer: A cultivator with an un-irrigated land holding up to one hectare or irrigated land holding up to one-half hectare.

Market value: The value of land determined in accordance with section 26 of RFCTLARR 2013.

Notification: A notification published in the Gazette of India or, as the case may be, the Gazette of a State and the expression 'notify' shall be construed accordingly.

Patta: Shall have the same meaning as assigned to it in the relevant Central or State Acts or rules or regulations made thereunder.

Non-Perennial Crop: means any plant species, either grown naturally or through cultivation that lives for a particular harvest season and perishes with harvesting of its yields.

Person interested: means— (i) all persons claiming an interest in compensation to be made on account of the acquisition of land under RFCTLARR 2013; (ii) the Scheduled Tribes and other traditional forest dwellers, who have lost any forest rights recognised under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (2 of 2007); (iii) a person interested in an easement affecting the land; (iv) persons having tenancy rights under the relevant State laws including share-croppers by whatever name they may be called; and (v) any person whose primary source of livelihood is likely to be adversely affected.

Prescribed: means prescribed by rules made under RFCTLARR 2013.

Project: Haryana Orbital Rail Corridor (HORC) project covering of around 121.472 km(143.932 Km including connectivity) from Palwal to Sonipat, via Sohna, Manesar, and Kharkhoda for which land is being acquired, irrespective of the number of persons affected.

Public purpose: means the activities specified under sub-section (1) of section 2 of RFCTLARR 2013.

Perennial Crop/Trees: means any plant species/trees that live for years and yields its products after a certain age of maturity (example of perennial trees – Mango, Guava, etc).

Requiring Body: means a company, a body corporate, an institution, or any other organization or person for whom land is to be acquired by the appropriate Government, and includes the appropriate Government, if the acquisition of land is for such Government either for its own use or for subsequent transfer of such land is for public purpose to a company, body corporate, an institution, or any other organization, as the case may be, under lease, license or through any other mode of transfer of land.

Resettlement Area: An area where the affected families who have been displaced as a result of land acquisition are resettled by the appropriate Government.

Scheduled Areas: The Scheduled Areas as defined in section 2 of the Provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996 (40 of 1996).

Small farmer: A cultivator with an un-irrigated land holding up to two hectares or with an irrigated land holding up to one hectare, but more than the holding of a marginal farmer.

Squatter: means those persons who have illegally occupied government land for residential, business and or other purposes by making some investments on the land.

State Government/ Government: refers to the Government of Haryana.

Tenant: A tenant is someone who pays rent for the place where they reside in, or for land or buildings that they use. The family residing/ occupying in the structures with some financial arrangements with the landlords, which may not be properly documented or legalized, are also considered as tenants.

Vulnerable Group/ Persons: Vulnerable group/ persons are those with challenges that make them at higher risk of falling into poverty compared to others in the projects area. The Vulnerable Group/ Persons the following categories: (i) PAFs falling under 'Below Poverty Line' (BPL) category¹; (ii) persons who belong to Scheduled Castes (SC) and Scheduled Tribes (ST); (iii) Female Headed Family/Household (unmarried women, separated/divorced, widow, etc); (iv) Elderly people above the age ofyears and living alone without direct support; and (v) People with disabilities or orphan.

Women Headed Family/Household: A family/household that is headed by a woman is called a Woman Headed Family/Household. The aforesaid woman may be a spinster or a widow or separated or deserted by her husband.

EXECUTIVE SUMMARY

1.0 BACKGROUND

The HORC project is being incorporated in August 2017 by the Haryana Rail Infrastructure Development Corporation Ltd (HRIDC) which is a State Joint Venture Company with 51% participation of the State of Haryana and 49% participation of the Ministry of Railways (MOR). The Haryana Orbital Rail Corridor (HORC) is a new electrified Double Broad-gauge (BG) rail line of around 121.742 route km from Palwal to Sonipat, via Sohna, Manesar and Kharkhoda bypassing the Delhi state. The total route length including connectivities to IR and Dedicated Freight Corridor network is around 143.932 km. The proposed HORC Project will have connection with the Dedicated Freight Corridor at Pirthala.

2.0 OBJECTIVE AND SCOPE OF THE ESIA STUDY

Objective of ESIA study is to carry out an Environmental Social Impact Assessment and preparation of an Environment Social Management Plan to mitigate the potential adverse impacts of the proposed project. ESIA scope includes preparation of environment and social profile, impact assessment, stakeholder and PAPs consultation, preparation of environmental and social management plans and estimation of ESMP budget. ESIA study is carried out considering Core Zone, Project Influence area and Buffer Zone. Core Zone also called as project area is Right of Way (Row) of the alignment i.e. a width of 50 m throughout the alignment. Project Influence area is 500 m on either side of the alignment. Buffer zone is considered as 500 m to 5 Km on both side of corridor for ecological study and 500 m to 10 km on both side of the corridor for other environmental features like landuse and landcover maps, Archaeological sites etc.

3.0 DESCRIPTION OF PROJECT

The proposed alignment passes through 17 stations (including 4 connectivity stations). The Proposed line runs parallel to Kundli-Manesar-Palwal (KMP) Expressway near Sohna-Manesar-Harsana Kalan Stretch and passes through 5 Districts i.e. Palwal, Nuh, Gurugram, Jhajjar and Sonipat in the state of Haryana. All the crossing stations have been proposed with minimum two common loops. The average inter distance between stations is 8.696 km. Land required for the project is tentatively assessed to be around 655.92 hectares, out of which private land is approximate 588.75 hectare. The corridor is proposed to be electrified with 25 KV, single phase, 50 Hz High Rise OHE. TSS - Traction Substations with 2x21.6 MVA transformers have been proposed at Dhulawat and Mandothi.

All the bridges for the project are proposed for 25T loading as per IRS bridge rules-2008 and provided with ballasted deck as per extant guidelines of Railway Board. The super structure of all major bridges is proposed either as Steel open web girders/plate girders or PSC slabs. RDSO type Composite Girders are proposed for ROBs. The bridges are designed for 100 years, All stations shall be class-B type with Standard-III interlocking having Electronic Interlocking, multi aspect LED based color light signaling, electrically operated point machine and DC track circuiting for detection of track section. As per DPR the overall capital cost for Haryana Orbital Rail Corridor including land cost is 4822.69 Crore.

4.0 KEY LAWS AND REGULATIONS

As per provisions of the Environmental Impact Assessment (EIA) Notification 2006 and its subsequent amendments by the Ministry of Environment, Forests and Climate Change (MoEF&CC), Rail Projects are exempted from requirements of Environmental Clearance. The policy framework and entitlements for the program are based on national and state laws: The Railways Act,1989, the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act,2013, RFCTLARR Act (Haryana Amendment in 2017). The project being funded by AIIB, hence Bank's Environmental and Social Policy (ESP), and the associated Environment and Social Standards (ESSs) namely, ESS 1: Environmental and Social Assessment and Management; ESS 2: Involuntary Resettlement; and the Environmental and Social Exclusion List will apply to this Project in addition to all National Environmental Regulations and Legislations. Due care has been taken to avoid or minimize land acquisition and involuntary resettlement impacts by exploring viable alternatives

5.0 BASELINE DATA

Landuse pattern shows that majority of the project area is crop land (72.75%), followed by builtup land (12.285). Six water samples (3 ground and 3 surface water) were collected along the alignment. The ground water is not found suitable for the drinking purposes. Overall surface water quality was found to be highly mineralized with report to dissolved solids with high content of sulphate and magnesium indicating health impact on children. Monitored air quality parameters were found to be with in the AAQS specified by CPCB and IFC except at one location i.e., at Farukh Nagar Town. Soil along the project area is found fertile for phosphorus and potassium but not as much for nitrogen. The maximum ground vibration was observed 81.6 dB at Delhi –Rohtak and minimum at Delhi- Rewari i.e., 78.6 dB at a distance of 10 m from the track. Out of the total 73 plant species, 67 species are under 57 genera and 34 families of dicotyledons showing the dominant vegetation of the study area whereas monocotyledons are represented by only 6 species under 6 genera and 3 families. A total of 58 species recorded from core zone and 73 species from buffer zone. Only 7 species have been put under Least Concern (LC) category and no threatened species have been recorded during the present survey. Out of 13 listed mammals only Mongoose, Rhesus Macaque & Hanuman langur falls under Schedule-II and rest under Schedule-III, IV & V as per Indian Wildlife Protection Act 1972. Out of the 13 species of mammals, 8 species have been found under the least concern (LC) category and one species (Herpestes brachyurus) is near threatened (NT) category. During the survey, a total of 19 species of avi-fauna have been recorded from the study site. Out of 19 listed bird species, Indian peafowl falls under Schedule-I, common myna falls under Schedule-III, one under Schedule-V and rest 16 falls under Schedule –IV as per Indian Wildlife Protection Act 1972. Asian common toad of amphibian fauna (Duttaphrynus melanostictus) was reported during the field survey in the core zone of the study area. As per tree survey it is estimated that about 6499 trees will be cut for construction of proposed project. No presence of habitat of significant importance for any Critically Endangered (CR) and/or Endangered (EN) and endemic species is found through direct and indirect evidence in the influence zone of the proposed alignment.

The socio-economic survey reveals that there are 9889 PAHs which includes 55.4% males and 44.6% females. Sex ratio of project districts is 806 per 1000 males which is much less than the State (879). The social stratification of the project area shows that dominance of Hindu with 91% households and general caste with 60% households. The survey data shows that highest 33.4% population belongs to the productive age group (19-35 years) whereas second highest 30%are in the age group of 36-59 years who are also economically active group. About 60% of household members are married and 86% of PAHs speak Hindi in Haryanavi dialect. The educational status of PAHs reveals that 15.3% of

surveyed people are still illiterate in the project area. Average family income is Rs.20,690/-per month. Majority of surveyed persons are cultivators. The SIA study indicates that there are 206 Scheduled Caste household being affected due to the project. But there are no Scheduled Tribes habitats or households in the project corridor

6.0 Environment and Social Impacts

Based on analysis of project, environmental and social settings, a detailed assessment of potential environment and social impacts due to project pre-construction, construction and operation stages have been carried out. For each of these adverse impacts, mitigation measures have been proposed. Various environmental impacts anticipated from the project during pre-construction and construction stage are: Felling of 6499 trees and clearing of 21.4232 ha of forest area for construction activities, water requirement of about 388.80 KLD, wastewater and solid waste generation of about 311.04 KLD and 288.00 Kg per day respectively from labour camps, Utility shifting/Drainage problems, access control and barricading, no impact on Archaeological Monuments and Heritage assets, soil erosion, air, noise and vibration pollution near construction sites, congestion near existing railway crossing, impact on quality of soil and water, impact on quarry and borrow area. During operation, negative environmental impacts will be of noise, vibration, congestion at stations.

As per the 20E Notification, the proposed project stretch will involve acquisition of 765.734 ha of land, of which 530ha (69%) of private land and 236.734ha (31%) of government land. Based on the census survey carried out for the project, the project affects 371 structures including 19 residential,14 commercial, 73 Borewells /wells,87 floor ramps,44 chabutra, nine stairs and 122 boundary walls. Of these total affected structures, 18 are public amenities/community structures. Out of this, four temples, four samadhis and one IOCL pipeline are saved due to minor changes of the alignment and flying over through structure. However, six ponds are required to be filled and these ponds are man-made surface water storage structures. The owners of these structures will be compensated as per the Entitlement Matrix.

Due to the project, 9889 PAHs of which 9885 PAHs are Title Holders and four PAHs are Non-Title Holders including one tenant and three kiosks are identified to be affected. Out of this, 9871PAH's livelihood will be affected due to acquisition of agricultural land, 14 households loose their commercial structures and four non-Titleholders will relocate themselves. Out of the total PAHs,491 vulnerable households will be affected.

Various benefits of the project are: Employment opportunity of the order of approximately 720 workers during construction, employment of 385 staff during operation, congestion reduction on road; no increase from current ambient noise, decrease in fuel consumption due to diversion of road traffic to railway and reduced air pollution of the order of 61100 (tCO₂/year) per annum due to shift of road traffic to rail.

7.0 PUBLIC CONSULTATION AND DISCLOSURE

Consultations and discussions with PAHs and PAPs were conducted to understand the perception, concern, and response from them. Public consultations were organised in 88 project affected villages during April- May2021. Villagers, Sarpanch, project affected persons, HRIDC and General consultant's social expert were present during consultation. The major issues raised by the people were land acquisition, demolition of structures, displacement, compensation, job opportunities, working women, infrastructure facilities like drinking water, health, school, and relocation of religious places. Major

environmental concern was air and Noise pollution due to construction of proposed rail project. The outputs obtained from these consultation meetings helped in formulating strategies for minimizing impacts. First stage consultation at village level is completed and second stage consultation at district level will be organized in each of five districts where PAHs, PAPs, local NGOs and Government agencies will be involved. In order to make the documents easily accessible, once the ESIA report is completed and finalized, it will be translated in the local language 'Hindi' and will be uploaded on HRIDC website.

8.0 GRIEVANCE REDRESS MECHANISM

Grievance Redress Mechanism (GRM) has been proposed for the project. There will be Grievance Redress Committees to hear and redress the grievances, if any, of the project affected families (PAFs) and Persons (PAPs) at local (project) level (Tier 1) as well as in the Head Quarter level in Gurugram (Tier 2). Tier 1 of GRC at field level will consist of Field staffs of HRIDC, GC, Contractor and Representative of Project Affected Persons. The time taken at the field level to address grievances will be 14 days with a provision of keeping the record of decisions. If the aggrieved party is not satisfied with the decision, appeal could be made to Grievance Redress Committee at Head Quarter level at Gurugram (Tier 2). The time taken to redress grievances will be 2 weeks at this level. The complainant may take recourse to the Court of law, if dissatisfied with the verdict of the GRM. PAPs are expected to approach the court of law after exhausting the remedy of GRC mechanism.

9.0 ANALYSIS OF ALTERNATIVES

Various alternatives such as design alternatives, technology alternatives have been considered and analyzed for its likely impacts on various environmental parameters. Additionally, an evaluation of potential environmental impacts in terms of 'with' and 'without' project situation has been considered for the justification of project.

10.0 Environmental and Social Management Plan

An environmental Management Plan (EMP) has been prepared for various impacts. Mitigation measures are designed for pre-construction phase, construction phase and operation phase. Various mitigation measure and management plan are suggested for: Loss of water bodies, Utility Diversion, Compensatory Afforestation, Construction Material Management and Housekeeping, Pre-casting yards and Material Stockpiling, Air Pollution and Dust Suppression, Noise and Vibration Reduction, Debris Disposal, Borrow Area Management, Solid and Liquid Waste Management, Hazardous Waste Management, Construction and Demolition Waste Management, Soil Contamination, Labour Camp, Welfare of Labour on Construction Site, Safety, Health and Hygiene of Construction Workers, HIV/AIDS Prevention in and around Construction Camp, Conservation for Peacock, Erosion Control, Traffic Diversion/Management, Biodiversity Monitoring. Implementation arrangement, Capacity building, EMP budget, EMoP and Reporting system has also been elaborated. A detailed EMP matrix with key mitigation measures, responsibility (phase wise) is also included. A semi-annual environmental and social monitoring report will be prepared by GC and submitted to AIIB through HRIDC. A Disaster Management Plan has also been included in the EMP chapter. The preliminary estimated cost of the EMP including implementation and monitoring is **INR 12.50 Crores**.

Social Management Plan (SMP) has been prepared for different stages of the proposed project. The social mitigation measures have been incorporated at all the stages of the project right from Designing phase to Construction and Operational Phase. All care has been taken to provide mitigation measures

for all expected social impacts at different stages. The SMP has been formulated for the proposed rail project for mitigation/management/avoidance of potential adverse impacts and the enhancement of the various social components along with overseeing/supervising responsibilities. The preliminary SMP budget is indicative, and cost will be updated and adjusted to the inflation rate as the project continues and during implementation. The cost of Land, structures and CPR along with trees and crops impacted for the proposed HOCR project is **INR 1239.748 crores**.

11.0 SUMMAY AND CONCLUSION

Project benefits far outweigh negative impacts. Overall, the major social and environmental impacts associated with the HOCR project are limited to the construction period and can be mitigated to an acceptable level by implementation of recommended measures and by best engineering and environmental practices. This project involves statutory approvals such as forest clearance and permissions from Pollution Control Board.

CHAPTER – 1 INTRODUCTION

1.1 BACKGROUND

State of Haryana is strategically located bordering the National capital of Delhi (NCT). Delhi shares three fourth of its border with Haryana alone and remaining with Uttar Pradesh. The development of Haryana region, bordering Delhi is very important for balanced growth of NCR as it acts as buffer zone against rampant migration and other support infrastructure. At present on account of growth of Metro network in Delhi & NCR, there is radial movement of commuters to and fro, Delhi being in center. This “Hub and Spoke” traffic planning has resulted in rapid growth of Noida, Greater Noida, Faridabad and Gurugram. However, for hub and spoke concept to sustain it is necessary to link the ends of spoke by ring connectivity. There will be natural demand for commuter movement within these towns like Gurugram, Faridabad, Ballabhgarh, Palwal, Sohna, Manesar etc. Peripheral roads have been commissioned recently, linking these towns around Delhi but rail link provides economical, sustainable, eco-friendly and bulk freight transport option. The peripheral Rail link will also help in growth of other cities within the same distance from Delhi like Sonipat, Panipat, and Rohtak.

Apart from passenger traffic, substantial amount of freight traffic, which is entering the Delhi area of rail network but is not meant to be consumed in Delhi, will also get diverted via the proposed HORC corridor. Apart from this, there are major goods sheds in the heart of Delhi causing endless avoidable traffic jams. The goods sheds in west Delhi are Azadpur, Shakurbasti, Dayabasti, Sabzi Mandi which are located on prime commercial land and are black spots of the urban planning. Previously moving out commercial activity to other states had interstate taxation issues but now with GST in place, there is no reason of not shifting these activities to the peripheral region. In any case, if freight traffic movement through Delhi is restricted, then these goods shed or alternatives will be serviced via the proposed peripheral network only.

NCRPB has been proposing the regional Rail Network or circular Railway around Delhi for the organized growth of NCR for last two decades. However, Railways did not accept the demand on account of resource constraints. But now, in view of policy changes, resources can be pooled by partnering with State Governments and other Stakeholders.

1.2 HARYANA RAIL INFRASTRUCTURE DEVELOPMENT CORPORATION (HRIDC)

The Haryana Rail Infrastructure Development Corporation Ltd (HRIDC) was incorporated in August 2017 as a State Joint Venture Company with 51% participation of the State of Haryana and 49% participation of the Ministry of Railways (MoR). HRIDC is mandated to design, develop, plan, construct, implement, operate and manage rail projects in the state of Haryana.

HORC is a part of Transport Infrastructure Corridor in Haryana National Capital Region (Master Plan approved by Government of Haryana (GoH)). The Kundli–Manesar–Palwal expressway is already commissioned in November 2018. Approximately 80% of HORC project alignment is along the Kundli–Manesar–Palwal Expressway, where 50-meter wide Land corridor is already reserved in the Master Plan for Orbital Rail and 10% alignment is along the Western Dedicated Freight Corridor.

1.3 OBJECTIVE OF ESIA AND ESMP

The specific objectives of the ESIA study are to:

- a. Identify and assess all relevant potential direct, indirect and cumulative environmental and social risks and impacts of the HORC project components and associated facilities (including

but not limited to those identified in Environmental and Social Screening study) and recommend specific mitigation, management, and monitoring measures, plans to avoid, offset or minimize the impacts;

- b. Formulate an implementable ESMP, RAP, and SEP integrating technically and economically feasible measures, timeframe, budget and capacity resources, and identifying the responsible entities to implement these measures, to avoid the identified impacts and an appropriate monitoring, supervision and grievance redressed mechanism to ensure its implementation.

1.4 SCOPE OF ESIA STUDY

The scope of the ESIA study covers the following:

- Environment Impact Study: Conduct Environment Screening Survey, Conduct Stakeholders Consultation, Collect Secondary Data on Environmental Parameters and support them with Primary Survey, Collection and Analysis of Data, Identification of Critical Environmental Issues, Identification of Applicable Statutory Clearances based on site visit and consultations;
- Social Impact Study -Data collection from primary sources, Social Survey of Potentially Project affected persons, Data collection from Secondary Sources, Conduct stakeholder Consultation/ Focus Group discussion, Identification of critical Social Issues/hot spot, Preparation of Initial Social Screening Report and Check List, covering involuntary resettlement and Indigenous Peoples, if any.

The letter of Acceptance to award ESIA study is given in **Annexure - 1.1** and term of reference for the study is given in **Annexure - 1.2**. The scope of ESIA study includes the following aspects:

a) Environment Impact Assessment (EIA)

- Preparation of Strip Maps of the Alignment;
- Preparation of Land Use Land Change (LULC) maps;
- Collection and review of Secondary data;
- Collection and Analysis of Baseline Data from the Study Area;
- Impact Assessment;
- Mitigation Measure.

b) Social Impact Assessment (SIA) and Resettlement Action Plan (RAP)

- Social Impact Assessment (SIA);
- Resettlement Action Plan
 - Land Audit of Land Acquired in the Past and Corrective Actions;
 - RAP for Land to be acquired for the entire project affected persons and non-titleholders.

c) Tribal Action Plan

The Tribal Action Plan (TAP) is to improve or at least regain the previous standard of living for vulnerable group of tribal communities. It is imperative that a meaningful and purposeful tribal action plan is prepared to attain the objective of the project. As per Census of India, 2011, field survey and public consultation, Scheduled Tribe (ST) is not present in the State of Haryana. Therefore, Environmental and Social Standard 3 (Indigenous People) of AIIB's Environmental and Social Framework (ESF) will not be applicable for proposed HORC Project.

d) Grievance Redress Mechanism

Grievance Redress Mechanism (GRM) is to ensure that the views and concerns of stakeholders on environmental & social issues are heard and acted upon in a timely, effective and transparent manner.

In order to resolve any arising Grievance the following steps will be carried out:-

- Provide sufficient and timely information to communities;
- Conduct meaningful community consultations;
- Build capacity for project staff, particularly community facilitators and other field-level staff.

e) Stakeholder Consultation and Disclosure of Documents

The section include the following:-

- Scope of the Public Consultations;
- Identification of Project Stakeholders/ Target Group;
- Target Area;
- Coordinate for Stakeholder Meeting (SHM's) and Methodology.

f) Institutional Capacity Building & Training

Institutional Capacity Building Addresses Capacity Building beyond the provision of education and training of professionals. It aims to enhance the capacity of governments, business, non-governmental groups and communities to plan and manage in an efficiently and effectively manner.

The main objectives of Institutional Capacity Building & Training are:-

- Clarify the Development Goals for provision of education and training;
- Identify Problems through the Institutional Diagnostic with Stakeholders;
- Formulate Solution Options for Institutional Issues: Change Strategy and Change Process;
- Coordinate Interventions to Support: Planning of Capacity Development;
- Construct a Results Framework and M&E Arrangements;
- Articulate and Validate the Strategy with Stakeholders.

g) Risk Assessment (RA) and Disaster Management Plan (DMP)

Formulation of a project specific RA and DMP in order to be in a state of preparedness to respond in a structured and systematic manner to the disasters when they occur, so that loss of human life is minimized and recovery is possible within a short time after the disaster.

h) Environmental and Social Management and Monitoring Plan (ESMP)

The ESMP provides the developers instructions on activities when implementing the project keeping in view all the environmental and social objectives. This plan covers all the phases of the project as follows:-

- Construction
- Operational
- Decommissioning

1.5 APPROACH AND METHODOLOGY FOR ESIA STUDY

1.5.1 Environmental Impact Assessment

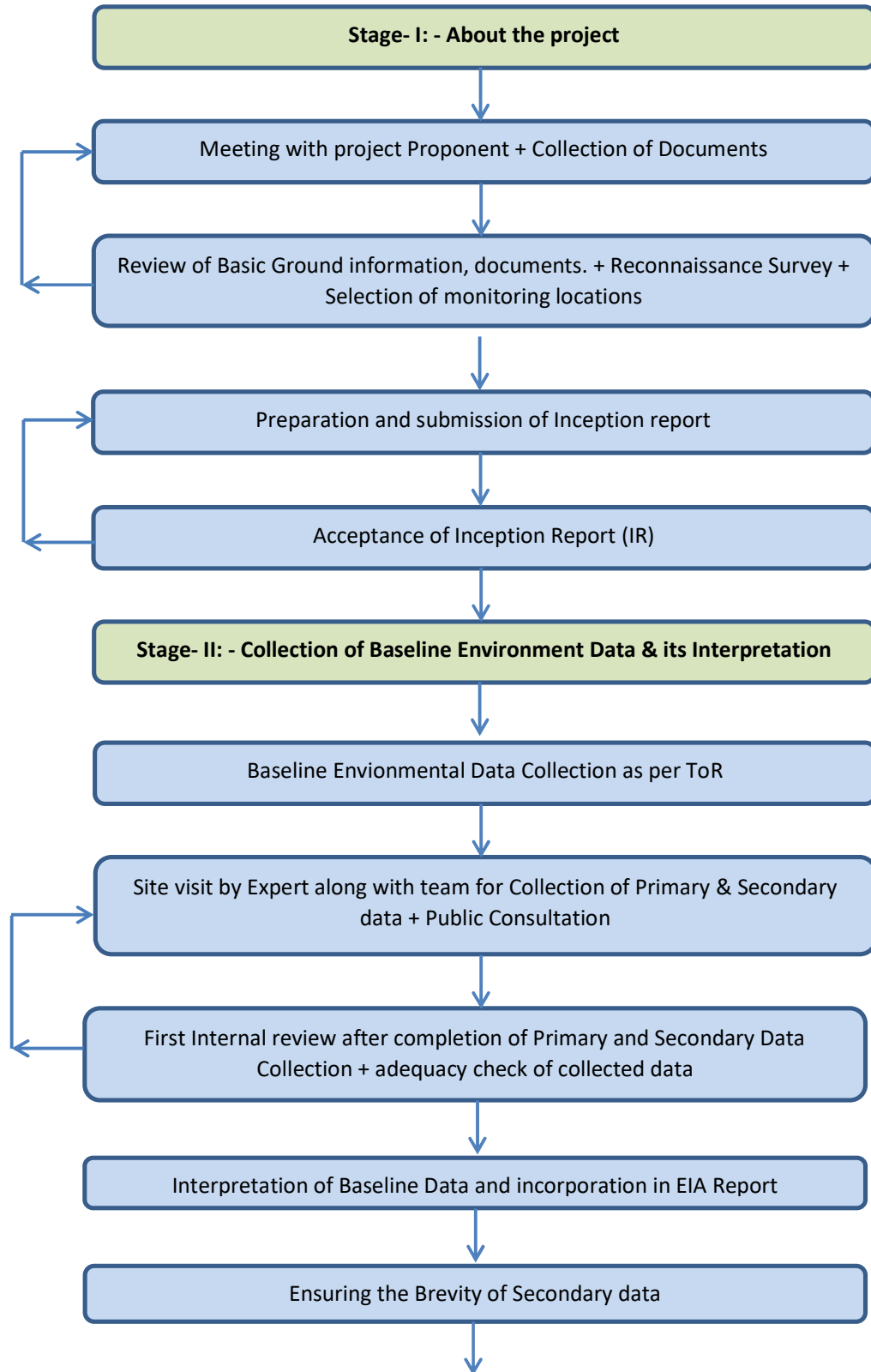
The environment impact assessment has been carried out following GOI/State policies and regulations as well as in compliance with AIB ESP requirement. Approach and methodology followed for carrying out the EIA study is given in this section. Environment Impact Assessment study is carried out considering the following zones:

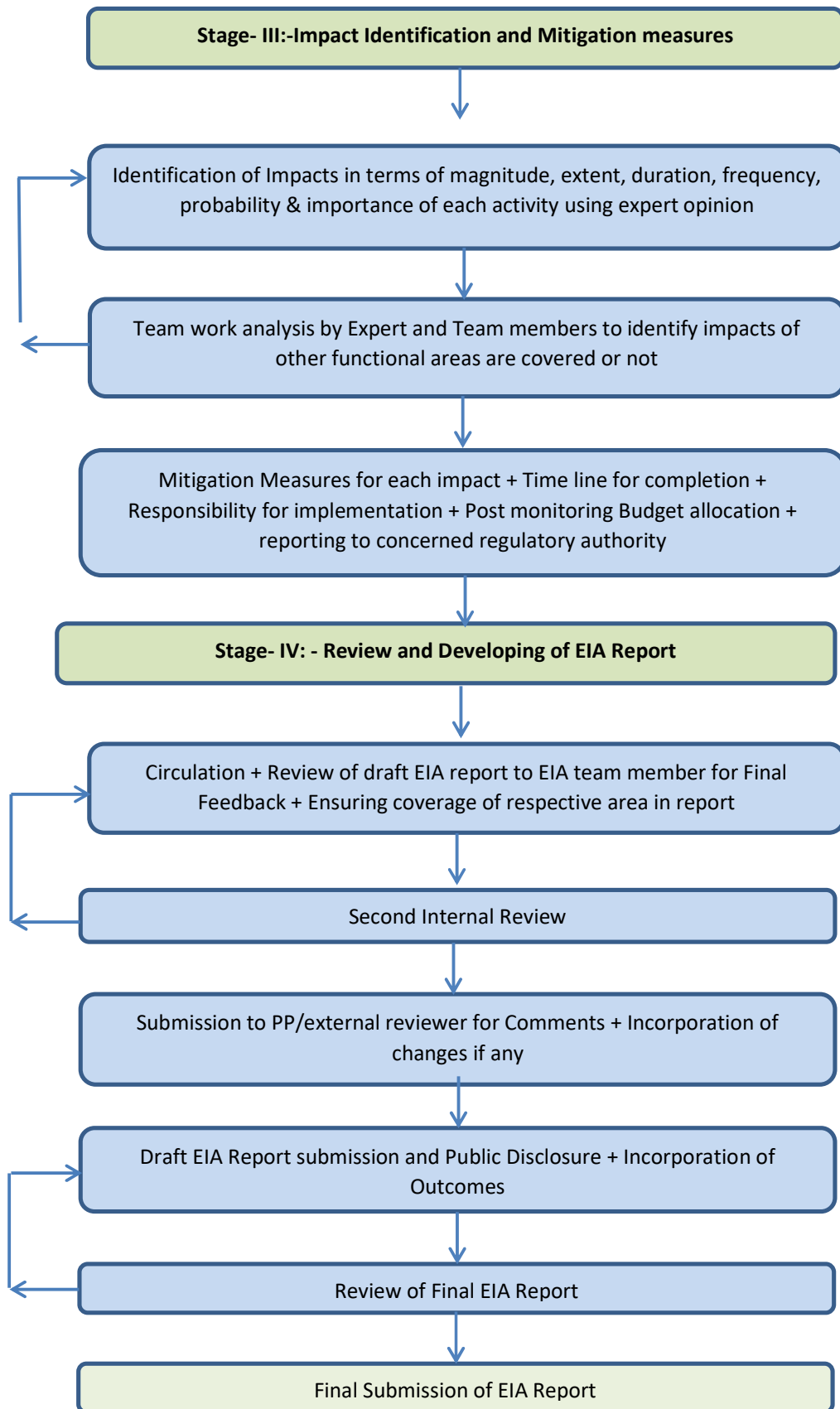
- a) Core Zone (Right of way of the alignment i.e. a width of 50 m throughout the alignment which is also called as project area);
- b) Project Influence area (0-500 m) i.e., centerline to 500 m on either side of the alignment;
- c) Buffer zone i) 500 m to 5 Km on both side of corridor for ecological study and ii) 500 m to 10 km on both side of the corridor for other environmental features like landuse and landcover maps, Archaeological sites etc.).

The detailed methodology for baseline data collection is given in **Annexure 1.3**.

Approach adopted for EIA study, which is in four stages is given in the following flow chart .

Approach Flow for EIA





1.5.2 Social Impact Assessment

For establishing the social baseline and undertaking the social impact assessment, a participatory approach was adopted. An attempt was made to integrate local community perspectives into the impact assessment process and identification of the mitigation measures. While conducting SIA study the consultant (OMTC) team has adopted participatory approach which was based on for:

1. A clear understanding of the project's wider objectives and the scope of work;
2. Various Acts, Policies and Guidelines issued by Govt. of India and Govt. of Haryana relevant to SIA, LA and R&R and AIIB policies;
3. A clear understanding and appreciation of the local conditions based on site visits and previous experience in similar projects;
4. Formulation of an appropriate work plan based on understanding of the important issues and likely time requirements;
5. Use of effective project management and coordination systems;
6. Conducting social surveys for assessing social impacts based on the Land Acquisition Plan (LAP) and alignment drawing approved and provided by the HRIDC;
7. Preparing SIA Report as per the scope of work issued by HRIDC and requirements of AIIB.

The following section provides the methodology adopted for undertaking the baseline data collection and impact assessment of the project.

Methodology

Table 1-1 presents approach and methodology of SIA study in the form of flow chart and various steps involved in the study have been described in detail in the following paragraphs.

1. Mobilization;
2. Review of literature;
3. Specifying the data requirements along with their sources;
4. Identification of all stakeholders and their involvement;
5. Scoping study in the field;
6. Conduct of socio-economic and census survey;
7. Assessment of the social impact of the project and informal discussion on compensation, assistance and income restoration programme.
8. Developing a social impact management / mitigation plan, indicating the likely entitlements to be provided to the affected communities / families / persons;
9. Incorporation of comments and submission of the final report.

Mobilization

The consultant on award of project mobilized the planning team to have an introductory meeting with the officers of HRIDC and local authorities of five districts of the project area.

Desk Research and reconnaissance survey

Available documents related to project and project area have been reviewed to develop understanding

about the project including broad technical aspects, the magnitude of impacts, laws and policies governing land acquisition, resettlement & rehabilitation, census report, etc. Specific documents reviewed for the project are as under:

1. Detailed Project Report, 2020, HRIDC;
2. The Right to Fair Compensation and Transparency in Land Acquisition & Rehabilitation and Resettlement Act, 2013;
3. Resettlement Policy Framework, 2021, HRIDC;
4. Census of India, 2011 (Primary Census Abstract and Village amenities directory);
5. AIIB's Environmental and Social Framework, 2016;
6. Gazette Notification No.S.O.-3/C.A.30/2013/S.30/2018 dated 23rd January 2018, Revenue and Disaster Management Department, Government of Haryana;
7. Railway Circular No. E (NG) II/2010/RC-5/1 dated 11/11/2019.

OMTC survey team conducted reconnaissance survey to get an overview of the magnitude of likely impacts on villagers in general and on people affected by the proposed HORC project in the five districts of Haryana State in particular.

Table 1-1: Approach and Methodology for SIA

APPROACH AND METHODOLOGY FOR SIA	
STEP: 1	<p>Mobilization</p> <p>Meeting and discussions held with Client</p> <p>Reconnaissance Survey and demarcating the area impacted by the project i.e., noting down the land marks, their GPS coordinates</p>
STEP:2	<p>Desk Research</p> <p>Review of relevant literatures</p> <p>Study of alignment drawings, Acts & Policies, Guidelines and other administrative documents after making available from Client</p> <p>Collection of data/information from Secondary Sources Formulation of DataCollection instruments from primary sources</p>
STEP:3	<p>Field Studies</p> <p>Site visit for verifying the alignments on ground and identify the impact zones/areas and information dissemination</p> <p>Class room and field training of Enumerators and Supervisors</p> <p>(It consisted of detail discussions on Questionnaires and Data collection methods, sampling process, identification of project affected structures and listing of structures and households etc.)</p> <p>Discussions with local community and local people about the projects, its benefits and adversities.</p>

	<p>Identification of affected structures</p> <p>Listing of structures</p> <p>Measurement of Structures</p> <p>Conduct of Socio-Economic Survey</p> <p>Conduct of Census Survey of households</p> <p>Conducting Focused Group Discussions, and</p> <p>Carrying out meaningful consultations with persons to be displaced by the Project</p>
STEP:4	<p>Data Processing & Data Analysis</p> <p>Scrutiny of filled-in-Questionnaires</p> <p>Coding, data entry & verification Data compilation and Data analysis</p>
STEP:5	<p>Report writing</p> <p>Writing of Draft SIA report and submission</p> <p>Writing of Draft RAP</p> <p>Submission of Final reports after incorporating the comments and suggestions of client, funding agency and others.</p>

Source of Data Collection

The study envisages collection of both secondary and primary data about the socioeconomic condition of the project area and persons affected by the proposed HORC project.

The sources of secondary data are:

1. Detailed project Report;
2. Screening Report;
3. Land Schedule;
4. Map of the project area and project details;
5. Resettlement Policy Framework (RPF) for HORC;
6. RFCTLARR Act 2013 and other relevant Acts and policies, guidelines;
7. District Statistical Handbook, Census Report 201.

Primary data was collected directly from affected households through door-to- door census and socio-economic survey, key informants/stakeholder's interviews, Focus Group Discussions (FGDs) and consultations at village level.

Field Visit and Data Collection

The field visits and studies were conducted between March to May 2021. OMTC team visited the sites along with HRIDC officials to verify the alignment drawing on the ground and to identify the affected areas. After identifying the project affected areas on the basis of LAP and alignment drawing provided by HRIDC, OMTC hired local investigators including female investigators considering restrictions and

social distancing measures associated with COVID-19 and provided training about the project and data collection process. During site visits the team verified the alignment drawings on the ground and also identified and consulted with various stakeholders to create awareness about the project. Accordingly, all features falling along the alignment were identified for social analysis. The survey team visited each and every potentially affected property/community structure indicating their nature and types, viz. Houses, Shops, industries, residential cum commercial structure, religious structure, offices, Schools, training institutes, hospital, irrigation canal, other infrastructures, agricultural farms, ponds, gardens, crops and trees etc.

Survey Tools for Data Collection

Survey tools namely, census survey format, socio-economic survey format, format for inventory of properties, inventory of trees enumeration, public consultation and focus group discussion checklist etc. were developed and discussed with HRIDC for incorporating suggestions and modifications. The formats were approved by HRIDC after due detailed discussion and then the survey tools were used in the field for data collection.

Enumeration & Mapping of Structure

Before the actual household socio-economic survey, all the structures (i.e., residential, commercial and common properties) that were likely to be affected by the project were identified and enumerated considering the CoI and its alignment drawing. The private assets were given unique code number, their type and use of structure were recorded.

Census Survey

Land acquisition plan provided by HRIDC formed the basis for conducting census and socioeconomic survey. Survey team was provided a village wise list of land owners with Jamabandi (Khewat and Khata No), Survey No. and area of acquisition for conducting the survey. Census survey was conducted with owners and others (encroacher, squatter, tenant) who were available during the survey. Efforts were made by revisiting the villages to conduct survey with as many affected persons as possible. Affected persons not staying in the concerned village and nearby areas and those whose whereabouts could not be traced have not been covered in the survey. The survey was conducted to generate data to assess the extent of impacts and to provide baseline data on socio-economic conditions of the PAPs. The location, type of structure (size and area), type of construction, and nature of use was recorded. Names of the owners, their addresses, possession of legal documents towards claim of the property, if any, and tenure status etc. were also recorded.

The survey team of OMTC with the help of village Patwari deployed by HRIDC conducted door-to-door personal interviews for census survey by using well-structured questionnaires. The questionnaires were pre-tested before survey. Before the commencement of field survey, all the field investigators were given orientation and extensive training about various aspects of the questionnaires. The questionnaires covered matters relating to identification of project affected persons, their social profile family details, occupation, source of income, family expenditure, documentary proofs, household assets, information on affected structure, commercial / self-employment activities, employment pattern, views on the project and resettlement and rehabilitation. The questionnaires contain a few open-ended questions like opinions and views of persons and a number of closed ended questions which have been duly codified. Data collection in household survey was not restricted to the questions enlisted in the questionnaire. Queries of the affected people were taken care of as far as possible. This helped in getting a better insight into the issues, gaining the confidence of the people and facilitating data collection.

Socio-Economic Survey

Household socioeconomic survey was carried out to assess impact of the proposed corridor on socio economic conditions of affected families. Questionnaire for socio- economic survey was developed keeping in view the baseline data needed for assessing the socio-economic conditions of project affected persons with specific concern to vulnerable sections of the society (Scheduled Caste, Scheduled Tribe, Women- Headed Household, Disabled, BPL and Elderly Persons, etc) for monitoring the status of project affected persons during and after the implementation of project, if any. The socio-economic survey was carried out for 20% of total affected households who were recorded during the census survey. The census and socio- economic data were collected during March - May 2021. A copy of Questionnaire for Census and Socio-economic Survey is given as **Annexure 1.4**.

Public/Stakeholders Consultation and FGDs

Preliminary public consultations and discussions were conducted by survey team with the help of HRIDC officials through community meetings with PAPs as well as general public at village level. The objective of conducting public consultation was to obtain views and suggestions of the potentially affected persons. The consultation process involved various sections of affected persons such as land owners, farmers, traders, women, squatters, kiosks and other inhabitants. Special care was taken during the study to hold discussions and to elicit the adverse effects they are anticipating due to the proposed project and their suggestions in this regard for mitigating the foreseeable adverse effects. During public consultations, issues related to land acquisition, compensation, income restoration, employment generation, station locations, rehabilitation of affected utilities, information flow, grievance redressal, safety, role of administration etc. were discussed. The methods which were adopted for conducting public consultations were (i) Walk-through informal group consultation, (ii) Focus Group Discussions (FGD) with different groups of affected people including farmers, residential groups, squatters, (iii) In-depth individual interviews, (iv) Discussions and interviews with key informants, (v) Sharing the opinion and preferences of the PAPs. A format for public consultation is presented in **Annexure 1.5**.

Interview with Key Informants

Key Informant Interviews provide qualitative in-depth information by the people, who matter in the society. These interviews were held with the village Sarpanch, Nambardar, Community leaders, Patwari, School Teachers, Anganwadi Workers, Govt. officials, who had first-hand knowledge about the village as well as the project. These interviews gave a perspective on the likely impact of the project.

Observations/Physical Verification

Observation method was used by survey team while conducting the fieldwork with Project Affected families (PAF) in the project area. This method was helpful in cross checking of the responses, facts and issues and in exploring other hidden facts with maximum validity and reliability. Several other facts like size and type of land or structure on project affected area, inventory loss, current use of affected area, livestock, and issues due to proposed project etc. were also validated through observation.

Photography and Videography

Photographs and video recording was done for all important locations i.e., Railway crossing, public service facilities, religious/historical places, of Land to be acquired and of impacted structures etc. Video recording was done of each interview, FGDs, each affected property, Market, available public service facilities and tourist places in the project affected area.

Data Processing and Analysis

Both quantitative and qualitative data analyzing methods and statistical techniques were used to analyse the data collected from primary as well as secondary sources. Survey forms duly filled were consolidated

and entered into a database. This information was updated on a regular basis as and when questionnaires were filled in. Once the data were collected and finalized with all the necessary changes, analysis of collected data was done district wise. In order to meet the AIIB's requirements, the consultant gave emphasis on analysis of data related to gender concerns/gaps, safety concerns, female participation, gender-based violence, cultural practices (early marriage, physical practices etc.), labour aspects, tribal issues (identity, land livelihood, relocation, cultural heritage etc.), physically challenged (their locations, sections, areas where actions could be planned to facilitate better access).

Writing of Draft Report

On the basis of information collected and analysed by using above methodologies, the necessary conclusion and recommendation were made and draft ESIA report was prepared.

Formal Public Consultation/Hearing

Formal public consultation would be organized in all five districts after giving adequate publicity about date, time and venue of public consultation to ascertain the views of the affected families relating to land acquisition, compensation and rehabilitation.

Final Report

The draft report will be finalized after incorporating the views/concerns/suggestions given by stakeholders during formal consultation meetings at district level.

Limitations & Challenges during Field Work

In order to collect relevant information from the project affected persons/ Households, establishing rapport and gaining their confidence was necessary, which in itself was a challenging task for the SIA team. The limitation of the study is as follows:

1. The correct information regarding the land size to be acquired was not available from the records.
2. During interview the respondents did not give answer to some questions in the same session in which they replied other questions.
3. People were trying to influence each other during the interviews, which was managed by requesting them again and again to provide privacy to the respondent.
4. Female respondents were initially very much hesitant and scared to provide information during interviews and many times were interrupted by their relatives.

It was very challenging to keep the survey team and all respondents safe from the COVID-19 virus. The team faithfully followed the standard operating procedures laid down by the consultant during the survey period

1.6 STRUCTURE OF REPORT

ESIA is structured as per the ToR and AIIBs guideline and policy as below in twelve chapters.

Executive Summary	
Chapter 1:	Introduction
Chapter 2:	Project Description
Chapter 3:	Policy, Legal and Regulatory Framework
Chapter 4:	Baseline Environmental and Social Data

Chapter 5:	Evaluation of Environmental and Social Risks and Impacts
Chapter 6:	Public Consultations and Information Disclosure
Chapter 7:	Stakeholder Engagement Plan
Chapter 8:	Grievance Redress Mechanism
Chapter 9:	Resettlement Policy Framework
Chapter 10:	Environmental and Social Management and Monitoring Plan
Chapter 11:	Analysis of Alternatives
Chapter 12:	Summary and Conclusions
Annexures	

CHAPTER – 2 PROJECT DESCRIPTION

2.1 INTRODUCTION

Haryana Rail Infrastructure Development Corporation Ltd. (HRIDC) is planning to develop Haryana Orbital Rail Corridor (HORC) from Palwal district to Sonipat district in the State of Haryana, bypassing Delhi. It is envisaged that the Haryana Orbital Rail Corridor (HORC) will facilitate the diversion of goods traffic not meant for Delhi region and will help in developing multimodal hubs in National Capital Region (NCR) region of Haryana. The project will serve open unnerved areas of the state of Haryana, thereby enhancing economic and social activity of the Haryana sub-region of NCR. The project will also serve passenger trains on this route, which will directly connect region of Gurugram with capital of state *i.e.* Chandigarh, bypassing Delhi, leading to reduced journey travel time.

During preliminary study, there was a proposal to connect Palwal- Manesar- Patli- Farukhnagar- Jhajjar to make a Western Peripheral Rail Corridor to connect Palwal to Sonipat bypassing Delhi. After Implementation of Kundli-Manesar-Palwal (KMP) expressway and the planning of Panchgram Urban centers, the Haryana Orbital Rail Corridor (HORC) project alignment from Palwal to Sonipat has been conceived on Techno-Economic consideration.

The alignment of this project is mostly along the KMP expressway along the inner side (towards Delhi). A 50 meter strip adjacent to the Right of Way (RoW) of KMP expressway is earmarked for the HORC alignment in the approved Master Plan for NCR area. In addition, a green belt of width 100 meters has also been earmarked on outer side of KMP Expressway and the inner side of HORC.

The proposed Rail corridor will facilitate the diversion of freight traffic not meant for Delhi and will help in developing Multi Modal Hubs in NCR region of Haryana. The proposed project will take off from New Pirthala station with suitable connectivity to existing Palwal station of Indian Railway and proposed Pirthala Yard of DFCCIL.

Project will also have connectivity with existing Indian Railway stations at Patli on Delhi- Rewari section, Sultanpur on Farukhnagar- Garhi Harsaru section, Asaudah on Delhi-Rohtak section and Harsana Kalan on Delhi-Panipat Section.

Existing and Associated Facilities

HORC project will use existing facilities at Prithala station of DFCCIL and Patli, Sultanpur, Asaudhah and New Harsana Kalan Station of Indian Railway during operation of HORC project.

As per AIIB Associated Facilities are activities that are not included in the description of the Project set out in the Legal Agreements governing the Project, but which, following consultation with the Client, the Bank determines are: (a) directly and materially related to the Project; (b) carried out, or planned to be carried out, contemporaneously with the Project; and (c) necessary for the Project to be viable and would not be carried out if the Project did not exist. There is no associated facility for the HORC project. The justification for the same is given in the following paragraphs:

Sleeper Plants or Ballast quarry: No new sleeper plants or quarries for ballast will be developed for the proposed project. Only existing licensed quarries and sleeper plants will be used for the project. Moreover, no additional power transmission line/substations will be developed by other agency.

Connectivity of HORC with existing stations of Indian Railways and DFCCL Network: These infrastructure do not come under the definition of Associated facilities, as IR and DFCCL network are having pan India spread with their independent status having much wider network. More importantly HORC do not exercise any influence or control over Railway or DFCCIL network for administrative processes.

Maruti Yard: Siding work is also not an associated facility as the same is being developed on their own & existing land. HORC connectivity to Maruti only gives operating business and no control is available with HORC management over Maruti Siding work. Maruti has requested HRIDC to execute the siding work as a deposit work only and Maruti is free to get this work executed from any agency also. Any environmental clearance is to be applied and processed by Maruti only at their own. Hence Maruti siding work is not an associated facility of HORC

2.2 NEED OF THE PROJECT

The proposed Orbital rail network will connect various important Districts of Haryana State adjacent to Delhi e.g. Gurugram, Faridabad, Ballabhgarh & Palwal area whose connection will also boost industrial as well as economic growth. Traffic pattern in the NCR region is of mixed type i.e. there is both passenger and freight traffic moving through this area. The metro rail can only be suitable for high density passenger traffic. Thus, the railway broad gauge network is the most suitable mode of transport for the mixed traffic particularly for the Special Economic Zones (SEZs) identified by the Govt. of Haryana in the NCR region. Thus, the proposed HORC rail network will play a major change to overcome the above hurdles in transportation needs and will go a longer way in development of the National Capital Region.

2.3 PROJECT OBJECTIVE

The objective of the development of this corridor is to facilitate and develop an orbital rail corridor connecting Palwal and Sonipat with suitable Rail corridor by easing out the Delhi region from the freight traffic movement by allowing shifting from radial and inner ring rail network to the proposed corridor. The other objectives for development of this project are as under:

- Delhi NCR being center acts as a Hub connecting the spokes in nearby states;
- Direct connectivity for Gurugram, Faridabad, Ballabhgarh, Palwal, Manesar & Farukhnagar etc. with all the districts of Haryana;
- Peripheral rail link will help in industrial growth of cities around Delhi (Sohna, Manesar, Gurugram, Jhajjar, Rohtak);
- Connectivity to Dedicated Freight Corridor (DFCCIL) at Pirthala;
- It will help in easing pressure from transport network of Delhi as traffic movements in radial will shift to peripheral;
- Freight traffic not meant for Delhi will get diverted and will help in developing Multi Modal Hubs in NCR region of Haryana;
- Connectivity to Maruti Suzuki, MET/Reliance, All Cargo and other Logistic Hubs in the region.

2.4 PROJECT LOCATION

The proposed alignment passes through five districts of Haryana state namely Palwal, Nuh, Gurugram, Jhajjar and Sonipat as shown in **Figure 2.1**. Proposed Haryana Orbital Rail Corridor is from Palwal to

Sonipat linking Asaoti- Patli-Asaudha & Harsana Kalan by new BG line. Total length of project is 143.932 Km (including Connectivity's). Key plan of the proposed HORC project is given in **Figure 2.2**.

2.4.1 Serving Stations and connectivity to Existing IR Network

All the crossing stations have been proposed with minimum two common loops. The average inter distance between stations is 8.696 kms. The station locations are identified with a prime importance of village centric. Proposed stations are listed down in **Table 2.1** below. Key plan is give at **Annexure 2.1** and typical Cross section is given at **Annexure 2.2**.

Table 2.1: Proposed Stations with Chainages for HORC Project

S. No.	Name of Proposed Station	Proposed Chainage (in m)	Latitude	Longitude
1	New Prithala	-687	28°14'33.66"N	77°15'7.43"E
2	Silani	9175	28°13'40.20"N	77° 9'12.46"E
3	IMT Sohna	18400	28°10'57.50"N	77° 4'56.69"E
4	Dhulawat	32100	28°15'1.32"N	76°57'24.52"E
5	Chandla Dungerwas	39419	28°17'41.66"N	76°54'13.66"E
6	Panchgaon	43100	28°19'32.32"N	76°53'29.81"E
7	Manesar	48700	28°22'23.49"N	76°52'27.12"E
8	New Patli	55040	28°25'45.93"N	76°51'52.54"E
9	Badsa	61561	28°29'11.25"N	76°51'0.83"E
10	Devarkhana	67940	28°32'18.61"N	76°49'40.42"E
11	Badli	73660	28°35'26.01"N	76°49'10.49"E
12	Mandothi	87480	28°42'36.00"N	76°50'26.45"E
13	New-Asaudah	91050	28°44'18.08"N	76°50'58.36"E
14	Jasurkheri	97140	28°47'14.65"N	76°52'38.94"E
15	Kharkhoda	105740	28°50'44.47"N	76°56'3.86"E
16	Tarakpur	111220	28°52'50.81"N	76°58'30.92"E
17	Harsana Kalan	124145	28°56'41.57"N	77° 2'18.72"E

Source: HRIDC

The serving stations for the connectivity shall be:

- Pirthala station on the Rewari-Dadri section of Dedicated Freight Corridor having connectivity to both Asaoti and Palwal with Y-connectivity.

The connectivities to Existing IR Network will be at:

- Patli station on Delhi-Rewari section of Northern Railways;
- Sultanpur station on Garhi Harsaru- Farukhnagar section of Northern Railways;
- Asaudah station on Delhi -Rohtak section of Northern Railways;
- Harsana Kalan on Delhi-Panipat section of Northern Railways.

2.4.2 Transportation Map of 10 km buffer zone of study area

The area is well connected by accessible national and state highway roads as given below in the **Figure 2.3**. National Highway No.8 connecting Delhi with Haryana at Gurgaon District. Major State Highways are- No. 13, No. 28, No. 26 and No. 15 A connecting Gurugram- Alwar, Palwal-Sohna, Gurugram-Rewari- Narnaul-Singhana road and Jhajjar- Farukhnagar-Gurugram respectively. Almost all the villages around the project are connected by metalled roads. Northern railway Broad gauge main line Delhi-Gurugram-Rewari and branch line Garhi-Harsaru-Farukhnagar meter gauge branch line was constructed as far back as in 1833 for the salt traffic of that area.

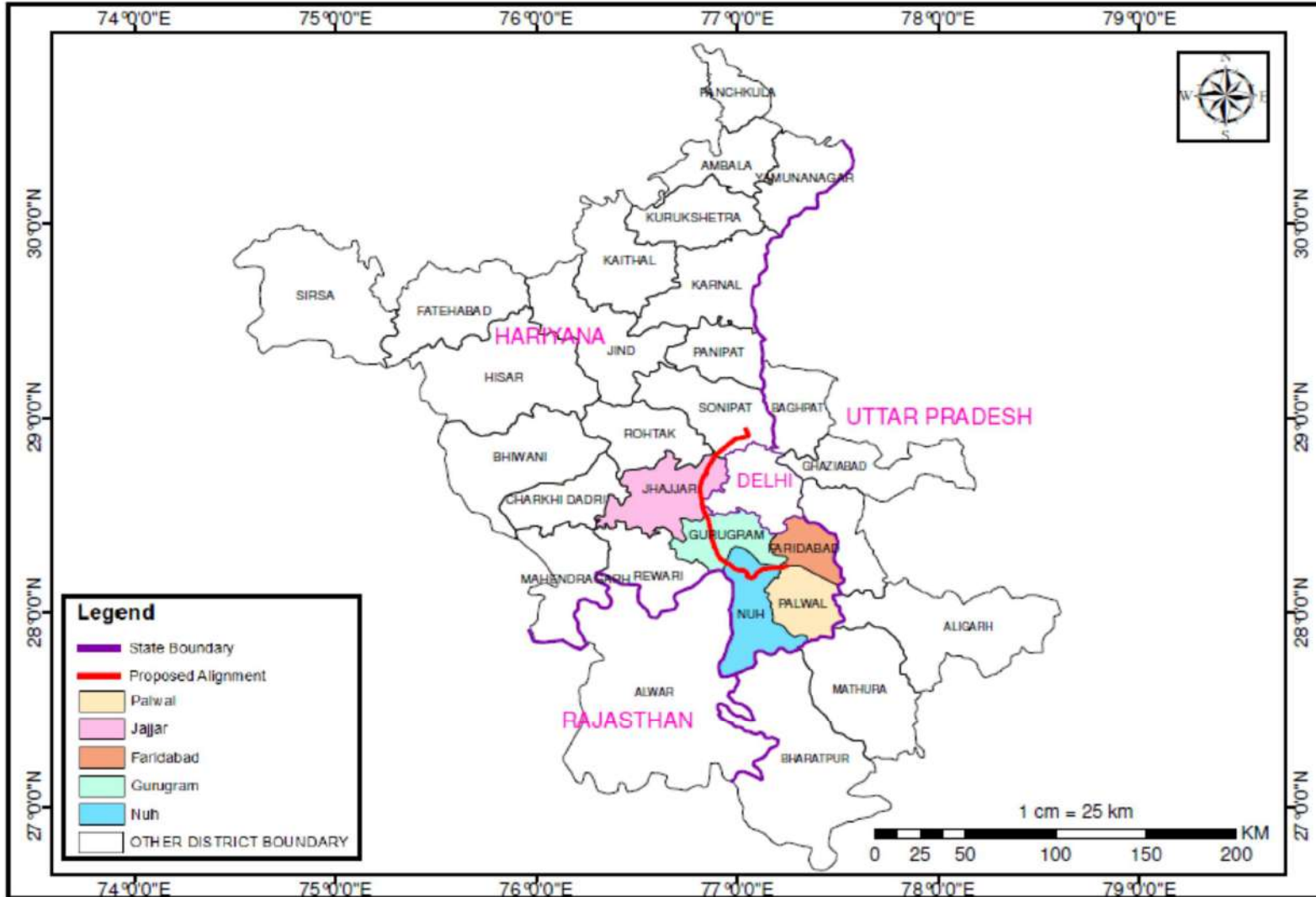


Figure 2.1: Districts from Which Proposed HARC Alignment Passes

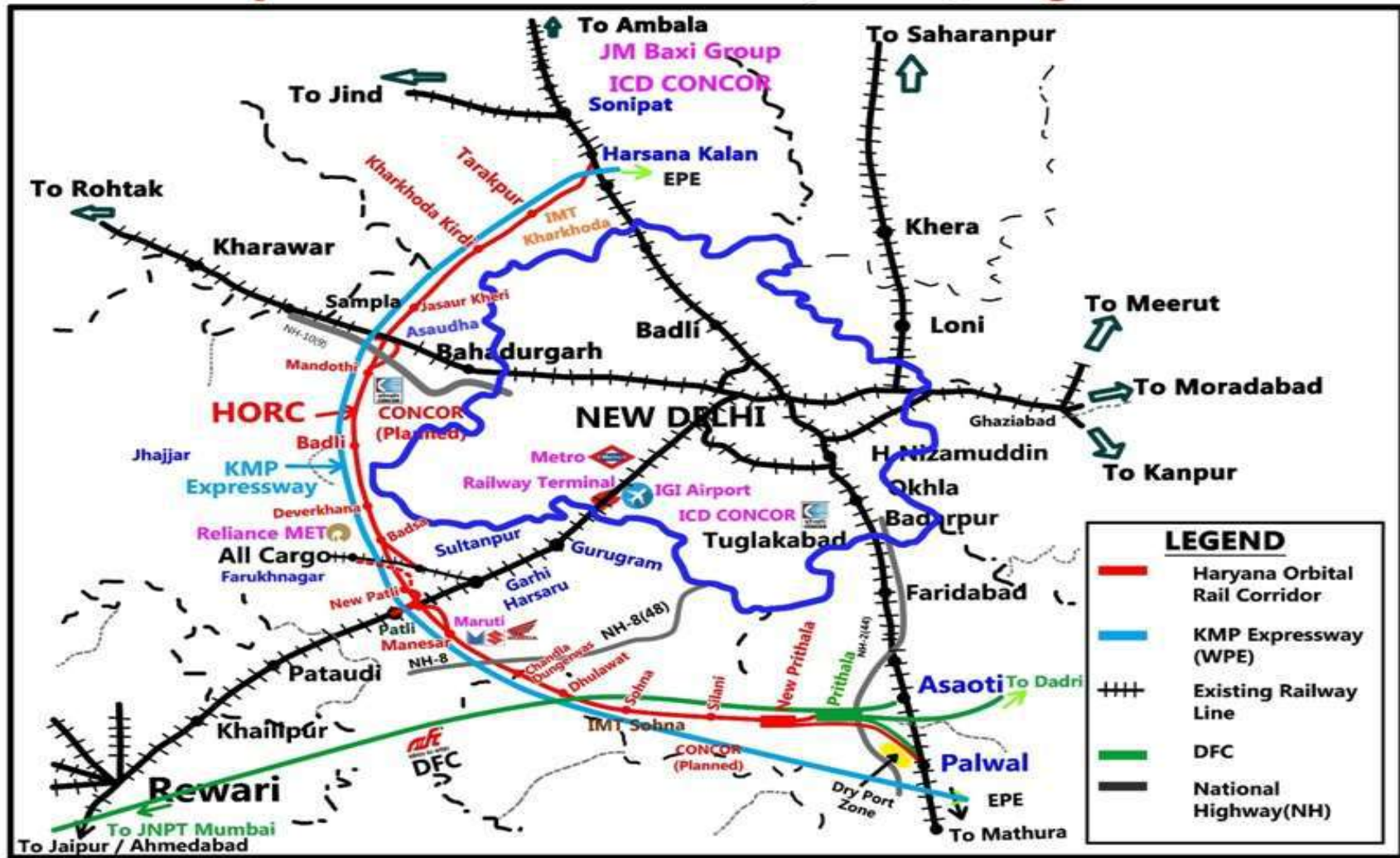


Figure 2.2 Key Plan of Proposed HARC Rail Corridor

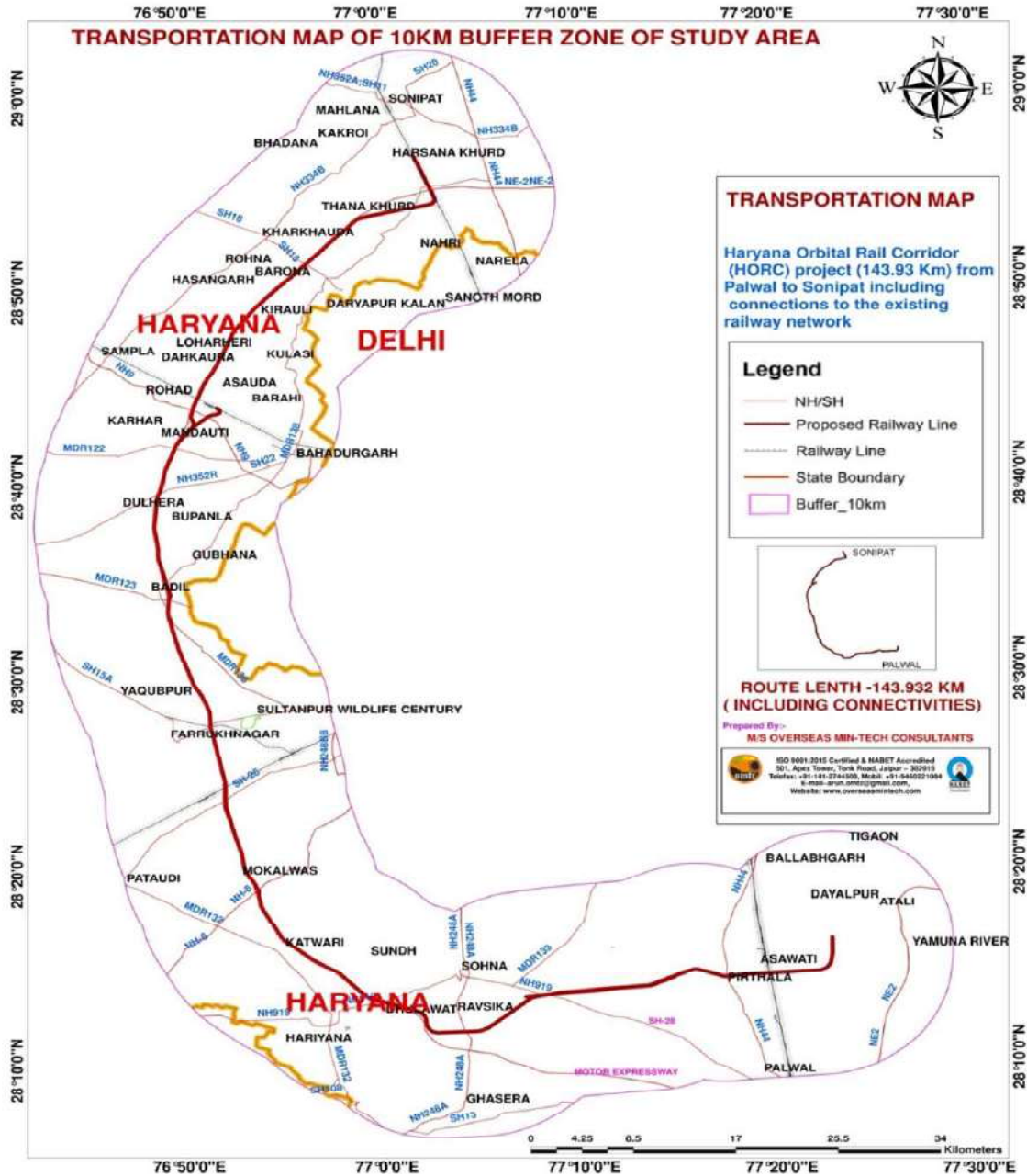


Figure 2.3: Accessible National and State Highway Roads from Proposed HORC Project

2.5 SALIENT FEATURES OF THE PROJECT

Salient features of proposed rail infrastructure facilities are as follows:

1.	Serving Railway Station	:	Harsana Kalan on Delhi-Ambala Line and Palwal & Asaoti (through Pirthala yard of DFCCIL) on Delhi-Mathura line
2.	Route length	:	121.742 Km 143.932 Km (including Connectivity's)
3.	Gauge	:	Broad Gauge 1676mm
4.	Ruling Gradient	:	1 in 150 (compensated)
5.	No. of Curves	:	89
6.	Maximum	:	160 kmph

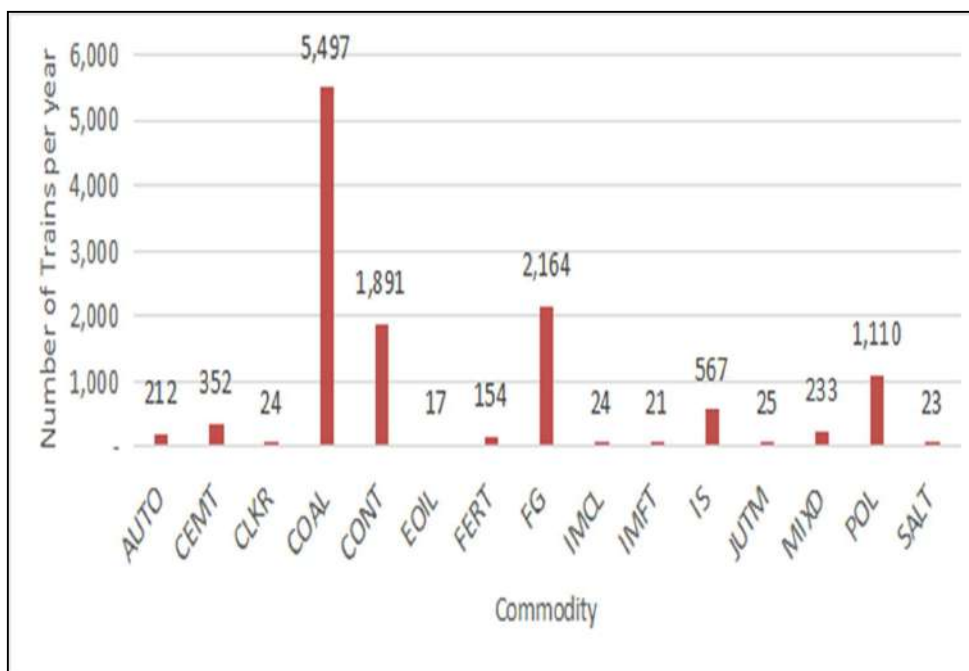
	Permissible Speed		
7.	Road bridge	:	120
	RFO	:	03
	Water Bridge		190
8.	Design Loading		IRS 25T Axle load
9.	Rails	:	60 Kg (T-12)/90 UTS - Prime quality (Indian Railway)
10.	Sleepers	:	60 kg PSC sleepers with 1660 Nos. Per Km (Indian Railway)
11.	Point and Crossings	:	1 in 12 with CMS crossings, thick web switches on PSC Sleepers with fan-shaped layout in crossing stations connecting with main line and loop lines
12.	Rail Joints	:	Primarily LWR Track with SWR on sharp curves and at other obligatory locations.
13.	Ballast	:	65mm size Ballast with 350mm cushion (Indian Railway)
14.	Type of Traction	:	Electrified (1x25KV AC-50HZ)
15.	Net Estimated Cost	:	Rs. 4822.69 Crores
16.	Number of stations of crossing/Junction stations	:	New Prithala, Silani, IMT Sohna, Dhulawat, Chandla Dungerwas, Panchgaon, Manesar, New Patli, Badsa, Devarkhana, Badli, Mandothi, New-Asaudah, Jasurkheri, Kharkhoda, Tarakpur and Harsana Kalan
17.	Safety Provisions	:	The stations and the locations where infringement from outside

Source: DPR

2.6 TRAFFIC DEMAND FORECAST

2.6.1 Freight Demand Forecast for Traffic

- The forecast includes the diversion of freight from existing railway routes passing in and around Delhi, traffic expected due to future expansion of industries & logistics centers and by diversion from existing road-based modes to railways on proposed HORC;
- The potential Assessed traffic that can be diverted through the proposed corridor is shown in the graph below. Based on the total tonnage of the divertible traffic, in 2018, Coal (55.08%), Food Grains (15.08%) and Containers (12.43%) form more than 70% of all divertible traffic;
- Traffic from Maruti Suzuki is 2.55 & 4.08 Rakes per day for the years 2022 and 2027 respectively;
- The train requirement for handling traffic shifted from road to rail is 2 trains/day.



Source: DPR of Project

2.6.2 Passenger traffic forecast

Passenger trips for the base year 2021 are calculated considering a per capita trip rate of 0.5 trips (assuming a household of two adults and two children where the earning member makes 2 trips in a day). It is further assumed that 30% of the trips will be travelling along the project corridor and 15% of these trips are considered as Rail based trips likely to use the proposed Railway corridor. Western Peripheral Expressway (KMP) is parallel, operational, fully access controlled and is a toll road where two wheelers and Public Transport stops are prohibited, thereby deterring passengers to use it for daily commute. It is envisioned that the service roads on either side of KMP will be used for local travel near the project corridor in future also & KMP expressway will be used mainly for bypassing Delhi. Anticipated passenger traffic is 22000 persons per day for starting year.

2.6.3 Potential trips along the project corridor

The forecasted total potential passenger trips along the corridor in immediate Influence area for horizon year by considering the growth rate of 1.66% is given in **Table 2.2** below:

Table 2.2: Total Potential Passenger Trips along the Corridor in Immediate Influence Area

S. No.	Year	Potential Trips (Passenger Trips/Day)
1	2011	146,281
2	2023	175,323
3	2027	190,366
4	2032	206,700
5	2037	224,435
6	2042	243,692
7	2047	264,602
8	2052	287,305

Source: DPR of Project

2.6.4 Total passenger traffic along the project corridor

The rail passenger demand for horizon year is calculated by considering 15 % of total potential trips as rail-based trips along the project corridor. Anticipated passenger traffic is 22000 persons per day for starting year. Passenger traveling by rail on the proposed rail corridor for horizon years is shown in the **Table 2.3** below.

Table 2.3: Total Passengers Travelling by Rail on Proposed Rail Corridor For Horizon Year

S. No.	Year	UP (Palwal to Harsana Kalan)	DN (Harsana Kalan to Palwal)	Total
1	2023	10,974	10,974	21,948
2	2027	11,916	11,916	23,832
3	2032	12,938	12,938	25,876
4	2037	14,048	14,048	28,096
5	2042	15,253	15,253	30,506
6	2047	16,562	16,562	33,124
7	2052	17,983	17,983	35,966

Source: DPR of Project

The passenger trains have been forecasted assuming a train capacity of 1200 passengers and presented in the **Table 2.4**.

Table 2.4: Total Passenger Trains for the Horizon Years

S. No.	Year	Passenger trains		
		UP (Palwal to Harsana Kalan)	DN (Harsana Kalan to Palwal)	Total
1	2023	9	9	18
2	2027	10	10	20
3	2032	11	11	22
4	2037	12	12	24
5	2042	13	13	26
6	2047	14	14	28
7	2052	15	15	30

Source: DPR of Project

It is estimated that there is a demand of 9 trains per direction every day on the proposed Haryana Orbital Rail Corridor (HORC) from first year of operation i.e. 2023. This has been forecasted to 15 trains in the year 2052.

2.7 LAND REQUIREMENT

As per the DPR, land area required for the construction of the project is assessed to be around 655.92 hectares, of which 70 hectares of land area is under Haryana State Industrial & Infrastructure Development Corporation(HSIIDC), 8 hectares of land area is under Indian Railways and 19.67 hectares of land area is under DFCL. Approximately 558.25 hectares of land is under private ownership(Table 2.5). As per 20 A Notification of the Railways Act, 1989 for land acquisition, 1072.76 hectares is required for acquisition. 20A Notification is basically issued for intention of land acquisition for the project. No government and private land is classified. As per 20E Notification, the project requires 526.606 hectares of private land and remaining 236.1272 hectares of Government land in which 129.91 hectares is under HSIIDC, 13.4748 hectares is under Indian Railways, 18.3116 hectares is under DFCL, 36.7308 hectares is under KMP, 8.58 hectares is under

road, 28.55 hectares is under Panchayat and 0.57 hectare is under Canal/Drain. No land will be acquired for temporary purpose. The total land requirement as per 20 E has been reduced from a total of 1073 ha to 765.734 ha (i.e., by 28.6% approximately).

Table 2.5: Land Requirement

S. No.	Description	Area (Ha)
1.	Total Land requirement	655.92
2.	IMT Sohna (Already acquired by HSIIDC)	10.00
3.	IMT Manesar (Already acquired by HSIIDC)	38.00
4.	IMT Kharkhoda (Already acquired by HSIIDC)	22.00
5.	Available DFCCIL Land	19.67
6.	Available Railway Land Requirement at Connection to Existing Station	8.00
	Net Private Land requirement (1-2-3-4-5-6)	558.25

Source: DPR

2.8 WATER REQUIREMENT

The water requirement for the proposed construction and operation work of HORC will be met through the nearby water supply sources. In case ground water is used, necessary permits will be obtained from CGWA/competent state authority. The detail breakup of water requirement during construction phase and operational phase is given in **Table 2.6** and **Table 2.7** below respectively.

Table 2.6: Water Requirement During Construction Phase

A	Water requirement for compaction	Unit	Quantity
1	Average Moisture content (as per baseline study)	%	3.803
2	Optimum Moisture Content (assumed)	%	6.5
3	Loss of Moisture content	%	1
4	Required Optimum Moisture content	%	3.697
5	Mechanical compaction of Earthwork	cum	23704895
6	Water required for compaction of soil	cum	876404
	Total of A	Litre	876403819
B	Water requirement for labour		
1	Requirement of labour	per km/day	5
2	Total labour requirement for 144 km	Nos	720
3	Total labour with family	Nos	2880
4	Water requirement per person per day (lpcd)		135
5	Water required for labour per day	l/d	388800.00
6	Total Construction period (5 years)	days	1825.00
	Total of B	Litre	709560000.00
C	Water requirement for concreting		
	Total of C	Litre	75000000

A	Water requirement for compaction	Unit	Quantity
D	Water requirement for sprinkling for 5 years		
1	Number of average active sites at any point of time considering length of an active site = 2 Km	Nos	10
2	Sprinkling frequency	per day	2
3	Capacity of tanker	litre	5000
4	Water requirement per day	litre	100000
5	Number of days sprinkling is required (considering 30 rainy days per year)	30	1675
6	Total water requirement during entire construction period	litre	167500000
Grand Total (A+B+C+D)		Litre	1828463819
Say		Million Litre	1828

*Detail water requirement for sprinkling is given in chapter 9.

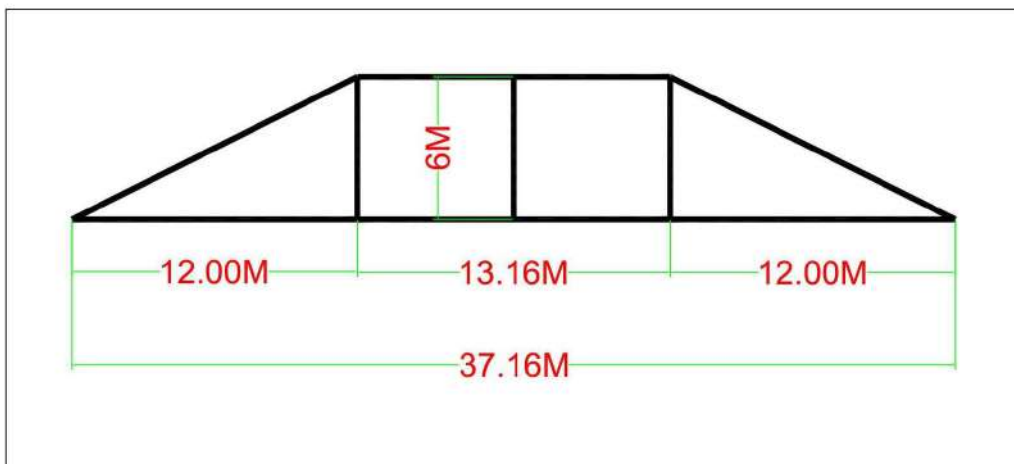
Table 2.7: Water Requirement During Operation Phase

S. No.	Particular	Liter per day	Unit	Quantity	Unit	Total water requirement (Litre/d)
1	Passenger	25	per passenger	22000	Nos	550000
2	Employee at office	45	Liter per head	385	Nos	17325
4	Washing of platform and floor	5	Liter per sqm	12000	sqm	60000
5	Automatic washing of carriages	300	Liter per coach	144	Liters per coach	43200
6	Cleaning of trains	500	Liter per coach	144	coach	72000
7	Watering of train at yard	1200	Liter per coach	144	coach	172800
Total					915325 Liter or 915.325 kld	
*Employee in office (385 No), Number of coach per train (16 No) and Platform area (1200 Sq. M)						

2.9 Quantity of Soil Requirement

The cross section of the embankment is selected on the basis of land use along the project. The land use is in urban, sub-urban and village areas. The typical cross section is given below. The quantity of earthwork in embankment is estimated as 24,948,680 cum.

Construction Material	Unit	Approximate Quantity	Source
Borrow Earth	Cum	23176169	Haryana
Ballast for track	Cum	769281	Rajasthan/Haryana
Rail (60 kg new rail)	RMT	615958.67	SAIL
Rail (60 kg SH rail)	RMT	50568	Northern Railway
Sleeper (PRC)			Haryana
60 kg Wider Base Ordinary	Nos	453682	Haryana/Faridabad
60 kg Guard Rail Sleepers	Nos	21749	Haryana/Faridabad
60 kg Flair	SET	198	Haryana/Faridabad
60 kg LC	Nos	44	Haryana/Faridabad
60 kg SEJ	Nos	2408	Haryana/Faridabad
60 kg 1:12 T/o	SET	185	Haryana/Faridabad
60 kg 1:8 1/2 T/o	SET	4	Haryana/Faridabad
60 kg DRS	SET	11	Haryana/Faridabad
Sleeper Channel H-Beam	Nos	5839	Haryana/Faridabad
Cement	Cum	121530	Rajasthan
Aggregate	Cum	387096	Rajasthan/Haryana
Sand	Cum	241380	Haryana
Water	Litre	75000000	Surface water, Haryana



2.10 REQUIREMENT OF CONSTRUCTION MATERIAL

The construction materials i.e. cement, aggregate, sand, water ballast and sleepers will be required for proposed HARC project. The detail of the construction material with unit, approximate quantity and sources are given in **Table 2.8**.

Table 2.8: Detail of Construction Material Required for Proposed HARC Project

2.11 MANPOWER REQUIREMENTS

The proposed project will provide employment to about 2880 laborers. Priority for employment will be given to local workers. Labor camps will be sited well away from local communities so as to minimize interactions between the workforce and the local populations as well as dependency to the

existing local infrastructure. Labor camps will be located away from rivers, canal or streams to prevent water pollution and shall be designed as per the local laws and guidelines.

Following are the infrastructural facilities which will be provided to the workers:

- Personal protective equipment such as ear muffs, gloves, helmets, shoes, goggles, etc. will be provided to the workers to ensure their safety;
- Working hours shall be displaced at conspicuous places;
- Strict compliance with relevant labor laws pertaining to the health and safety of workers, employees and others shall be ensured;
- All construction sites shall be secured with tamper-proof fence, with security lighting and regular security patrols;
- Sufficient supply of potable water to all workers and employees on-site shall be ensured;
- Water storage tanks will be located above ground and boreholes shall be away from toilets/drains;
- Separate accommodation and bathrooms for men and women shall be provided;
- Wastewater from the camps would be suitably treated and disposed away from the sites as per the applicable standards and guidelines;
- Regular spray of a mixture made from diesel and insecticides shall be done at all water stagnation areas to avoid mosquito breeding and spread of any vector borne diseases;
- Garbage bins shall be provided at suitable locations and it will be ensured that each site is tidy and refuse taken to a licensed site regularly;
- Adequate drainage at construction camps shall be maintained to avoid accumulation of stagnant water.

2.12 POWER REQUIREMENT

The total track length of the the proposed corridor is 143.932 TKM & length of Over Head Conductor is 305 TKM. The corridor is proposed to be electrified with 25 KV, single phase, 50 Hz High Rise OHE. TSS - Traction Substations with 2x21.6 MVA transformers have been proposed at the following locations for power supply to the sections. The detail of power infrastructure & electrical engineering work is attached as **Annexure 2.3**.

S. No.	Station	Rating	Capacity
1	Dhulawat	220/132/27.5 kV	2x21.6 MVA
2	Mandothi	220/132/27.5 kV	2x21.6 MVA

Over Head Equipment’s (OHE) and Supervisory Control and Data Acquisition System (SCADA) have been proposed for the proejct. Necessary modifications to the power line crossings of 11/33KV line have been considered. Electric power supply system including 220, 132 KV D/C transmission line from SEB Grid substation to TSS & modification in Grid Substation also considered..

In order to improve system reliability, the provision of Integrated Power Supply (IPS) system with 300AH LM Battery has been considered. This will have an added advantage of ensuring uninterrupted power supply round the clock, preventing signal going blank.

Power will be transrnitted to Traction Substation from Nearest Grid Sub Station of HVPNL. The source of power will be decided by Northern Railway and Railway Board in Open Access. Traction Substation and Transmission Lines are part of HORC project.

2.13 BASIS OF DESIGN

Take off at New Pirthala Station

Alignment for Haryana Orbital Rail Corridor is proposed by taking-off from Common Loop Line No. 1A at Ch. 91861.351 m F/CSB of Pirthala DFC yard for proposed loop line on New Pirthala Yard. A New Pirthala yard has been proposed for this section. For computing the route length of proposed alignment, the CSB of New Pirthala Yard is assumed as 0.00m. Subsequently the Chainage towards Sonipat has been considered as positive.

Connectivity to Patli Station (Delhi-Rewari section)

Connectivity to Patli Station has been planned on Down Loop Line from the proposed Manesar Junction station & on Down Loop Line from New Patli Junction Station in order to cater for the traffic flow to & from the proposed Haryana Orbital rail Corridor alignment with Delhi–Rewari route. For computing the route length of the connectivity, the CSB of proposed Manesar & New Patli Junction stations assumed as 0.00m. Subsequently the chainage towards Patli has been considered as positive.

Connectivity to Sultanpur Station (Garhi Harsaru-Farukhnagar section)

Connectivity to Sultanpur station has also been planned from Common DN Loop Line of Badsa Junction Station of the proposed Haryana Orbital rail Corridor alignment to cater for the Traffic flow. For computing the route length of the connectivity, the CSB of proposed Badsa Junction stations are assumed as 0.00m. Subsequently the Chainage towards Sultanpur Station has been considered as positive.

Connectivity to Asaudah Station (Delhi-Rohtak section)

Connectivity to Asaudah Station has been planned from Down Loop Line of the proposed Mandothi Junction station in order to cater for the traffic flow from the proposed Haryana Orbital rail Corridor alignment with Delhi – Rohtak route. For computing the route length of connectivity, the CSB of proposed Mandothi Junction station is assumed as 0.00m. Subsequently the chainage towards Asaudah has been considered as positive.

Connectivity to Harsana Kalan Station (Delhi-Panipat section)

New Harsana Kalan crossing station has been proposed at a distance of 2.1 km (approximately) away from Existing Harsana Kalan Halt station towards Delhi end parallel to Delhi-Panipat line for respective movements of the proposed Traffic.

2.14 CIVIL ENGINEERING STRUCTURES AND WORKS

Salient features of the project alignment is as under:-

- Length from New Palwal to Harsana Kalan – 121.742 Km;
- Connectivity to existing Asaoti Station (through Pirthala station of DFC);
- Connectivity to Palwal station of IR from New Palwal Station of HORC. This connectivity shall be provided by the DFCCIL as per the decision of RB conveyed by RB inspection note no 2011/Infra/6/20 dated 11.04.2019;
- Connectivity to Pirthala station of DFCCIL;

- Connectivity to Patli station (Delhi-Rewari line) from Manesar Station - 6.02 Km;
- Connectivity to Patli station (Delhi-Rewari line) from New-Patli Station– 3.45 Km;
- Connectivity to Sultanpur Station (Garhi Harsaru-Farukhnagar line) from Badsa station -4.72 Km;
- Connectivity to Asaudah station (Delhi-Rohtak line) from Mandothi station - 8 Km;
- The minimum and maximum inter distance between the proposed crossing stations are 5.063 Km and 16.869 Km;
- Total 89 curves are proposed in the enroute. The maximum degree of curvature considered as 5 degree;
- Land required for construction is 655.92 Hectares, of which 70 Hectares of land is under HSIIDC, 8 Hectares under Railway and 19.67 Hectares is under DFCCIL;
- All the bridges on the proposed new BG line will be of 25 T Axle loading and provided with ballasted deck as per extant guidelines of Railway Board;
- Track structure is proposed with 60 Kg. 90 UTS Rails on PSC sleepers 1660 Nos. per KM and 350 mm ballast cushion;
- 2.88 km (from Chainage 24200m to 27080m) tunnel is proposed enroute.

The project is divided into the following components for civil engineering structures and works:

1. Formation in Filling/Cutting
2. P. Way
3. Tunnels
4. Bridges
5. Station Buildings
6. Staff Quarters
7. Supervisory/Administrative Offices

2.14.1 Formation in Filling/Cutting

Vertical and horizontal alignment of the track was ascertained based on the land availability and gradient considerations. From the alignment parameters, earthwork in cutting and embankment were calculated based on the Proposed Formation Levels and Existing ground levels and in accordance with the standard cross section for double line track in the P. Way manual.

2.14.2 P. Way

Quantities of rails, Points and crossings, fastenings, welds, guard rails, steel channel sleepers and ballast were ascertained for the standard BG track with 60 Kg 90 UTS rails for main line and loops with sleeper density of 1660 in main line & 1540 in loop lines..

2.14.3 Tunnels

Alignment encountered a tunnel of 2.88 km (from Chainage 24200m to 27080m). Based on the terrain it was assumed that the alignment passes through fairly weathered rock and 55% of the passage requires special protection. For tunnel NATM method (New Austrian Tunneling Method) will be adopted as the

method has often been mentioned as a value engineered due to use of light, informal support. NATM use modern means of monitoring and surface stabilization such as shotcrete and rock bolts. The New Austrian Tunneling Method constitutes a design where the surrounding rock- or soil formations of a tunnel are integrated into an overall ring like support structure. Thus the formations will themselves be part of this support structure. The total excavated debris quantity from Tunnel blasting is attached in detail in **Annexure 2.4**. The waste from tunnel construction will be excavated material like rock and soil. The estimated quantity of waste generated will be 2.44 lakh cum (rock is 1.2 lakh cum and soil 1.24 lakh cum).

Excavated materials from tunneling work will be disposed off by utilizing the same in Approaches of tunnel i.e. Rock material in viaduct on Palwal side as well as in tunnel concreting and soil material in embankment on Sonipat end.

The main principles of NATM are

- The main load-bearing component of the tunnel is the surrounding rock mass. Support is ‘informal’ i.e. it consists of earth/rock-anchors and shotcrete, but support and final lining have confining function only. Maintain strength of the rock mass and avoid detrimental loosening by careful excavation and by immediate application of support and strengthening means. Shotcrete and rock bolts applied close to the excavation face help to maintain the integrity of the rock mass.
- Rounded tunnel shape: avoid stress concentrations in corners where progressive failure mechanisms start. Flexible thin lining: The primary support shall be thin-walled in order to minimize bending moments and to facilitate the stress rearrangement process without exposing the lining to unfavorable sectional forces. Additional support requirement shall not be added by increasing lining thickness but by bolting. The lining shall be in full contact with the exposed rock. Shotcrete fulfills this requirement.
- Statically the tunnel is considered as a thick-walled tube consisting of the rock and lining. The closing of the ring is therefore important, i.e. the total periphery including the invert must be applied with shotcrete.
- In situ measurements: Observation of tunnel behavior during construction is an integral part of NATM. With the monitoring and interpretation of deformations, strains and stresses it is possible to optimize working procedures and support requirements.

2.14.3.1 Justification for Tunnel Selection

Tunnel is proposed for the project as there is Aravalli Hill in the alignment and there is no other option except tunnelling.

2.14.4 Bridges

All the bridges are proposed for 25T loading as per IRS bridge rules-2008 and provided with ballasted deck as per extant guidelines of Railway Board. The super structure of all major bridges is proposed either as Steel open web girders/plate girders or PSC slabs. RDSO type Composite Girders are proposed for ROBs. The bridges are designed to be durable and to serve satisfactorily for full minimum design life i.e., 100 years, as per in Clause 15.1.3 of IRS Concrete Bridge Code. Bridges are classified as follows:

- Important bridges: linear waterway of 300m or total waterway of 1000sqm or more;
- Major bridges: linear waterway of 18m or more, or clear span of 12m or more;
- All other bridges are considered as minor bridges.

The lists of Bridges and waterways are given below in **Table 2.9**. Detailed bridge list of the proposed alignment is attached as **Annexure- 2.5**.

Table 2.9: Bridges and Waterways Proposed in the Project Alignment

S. No.	Intermediate Structures	Chainage (m)	No.
1.	RFO	52553.668	3
2.	RFO	58509.297	
3.	RFO	91063.999	
4.	Road Bridge	-1492.897	120
5.	Road Bridge	-1464.388	
6.	Road Bridge	-1307.181	
7.	Road Bridge	-936.125	
8.	Road Bridge	-521.528	
9.	Road Bridge	-320.542	
10.	Road Bridge	252.641	
11.	Road Bridge	1006.611	
12.	Road Bridge	1225.934	
13.	Road Bridge	1762.73	
14.	Road Bridge	2791.333	
15.	Road Bridge	3698.009	
16.	Road Bridge	4176.783	
17.	Road Bridge	4658.299	
18.	Road Bridge	5120.436	
19.	Road Bridge	6200.113	
20.	Road Bridge	6879.781	
21.	Road Bridge	7078.679	
22.	Road Bridge	7325.956	
23.	Road Bridge	7356.263	
24.	Road Bridge	7620.539	
25.	Road Bridge	8671.851	
26.	Road Bridge	9220.681	
27.	Road Bridge	9696.184	
28.	Road Bridge	10024.343	
29.	Road Bridge	10521.633	

S. No.	Intermediate Structures	Chainage (m)	No.
30.	Road Bridge	10849.391	
31.	Road Bridge	11619.391	
32.	Road Bridge	14066.514	
33.	Road Bridge	15468.867	
34.	Road Bridge	16016.775	
35.	Road Bridge	18592.617	
36.	Road Bridge	20365.634	
37.	Road Bridge	20803	
38.	Road Bridge	20823.233	
39.	Road Bridge	21123.681	
40.	Road Bridge	28827.274	
41.	Road Bridge	32202.924	
42.	Road Bridge	33710.757	
43.	Road Bridge	34966.011	
44.	Road Bridge	36402.578	
45.	Road Bridge	36870.342	
46.	Road Bridge	38834.32	
47.	Road Bridge	40281.547	
48.	Road Bridge	42386.15	
49.	Road Bridge	43687.551	
50.	Road Bridge	44157.572	
51.	Road Bridge	45234.759	
52.	Road Bridge	45662.105	
53.	Road Bridge	47342.96	
54.	Road Bridge	47682.319	
55.	Road Bridge	48381.381	
56.	Road Bridge	49607.188	
57.	Road Bridge	51320.301	
58.	Road Bridge	53104.988	
59.	Road Bridge	54548.028	
60.	Road Bridge	55921.822	
61.	Road Bridge	56726.625	
62.	Road Bridge	58561.39	
63.	Road Bridge	59169.755	
64.	Road Bridge	60374.398	
65.	Road Bridge	61320.834	
66.	Road Bridge	61735.764	
67.	Road Bridge	62761.311	
68.	Road Bridge	64065	
69.	Road Bridge	65058.202	
70.	Road Bridge	65898.564	
71.	Road Bridge	66579.008	
72.	Road Bridge	67183.67	
73.	Road Bridge	68550.651	

S. No.	Intermediate Structures	Chainage (m)	No.
74.	Road Bridge	70260.315	
75.	Road Bridge	71185.148	
76.	Road Bridge	71764.365	
77.	Road Bridge	72952.688	
78.	Road Bridge	75365.171	
79.	Road Bridge	75884.699	
80.	Road Bridge	76904.761	
81.	Road Bridge	78304.061	
82.	Road Bridge	78882.139	
83.	Road Bridge	79598.141	
84.	Road Bridge	81506.891	
85.	Road Bridge	82073.179	
86.	Road Bridge	82907.046	
87.	Road Bridge	83611.799	
88.	Road Bridge	85872.783	
89.	Road Bridge	87138.39	
90.	Road Bridge	87824.648	
91.	Road Bridge	88631.826	
92.	Road Bridge	91580.817	
93.	Road Bridge	92212.41	
94.	Road Bridge	92837.381	
95.	Road Bridge	93385.109	
96.	Road Bridge	94506.531	
97.	Road Bridge	95958.32	
98.	Road Bridge	97591.081	
99.	Road Bridge	98245.369	
100.	Road Bridge	99366.418	
101.	Road Bridge	99380.863	
102.	Road Bridge	101015.294	
103.	Road Bridge	101376.314	
104.	Road Bridge	103380.997	
105.	Road Bridge	104306.977	
106.	Road Bridge	105054.348	
107.	Road Bridge	105902.579	
108.	Road Bridge	106877.293	
109.	Road Bridge	108393.796	
110.	Road Bridge	108870.247	
111.	Road Bridge	109675.262	
112.	Road Bridge	111588.793	
113.	Road Bridge	112377.862	
114.	Road Bridge	113100.535	
115.	Road Bridge	113605.676	
116.	Road Bridge	114670.843	
117.	Road Bridge	115192.211	

S. No.	Intermediate Structures	Chainage (m)	No.
118.	Road Bridge	116212.251	
119.	Road Bridge	117397.06	
120.	Road Bridge	118722.612	
121.	Road Bridge	119428.825	
122.	Road Bridge	119827.757	
123.	Road Bridge	119865.98	
124.	Waterway Bridge	-1476.983	190
125.	Waterway Bridge	-1280	
126.	Waterway Bridge	-420	
127.	Waterway Bridge	-313.158	
128.	Waterway Bridge	-94	
129.	Waterway Bridge	1752.231	
130.	Waterway Bridge	2470	
131.	Waterway Bridge	4210	
132.	Waterway Bridge	6005	
133.	Waterway Bridge	7305	
134.	Waterway Bridge	7342.865	
135.	Waterway Bridge	7600	
136.	Waterway Bridge	7643.164	
137.	Waterway Bridge	7912	
138.	Waterway Bridge	8240	
139.	Waterway Bridge	9055	
140.	Waterway Bridge	9175	
141.	Waterway Bridge	9410.7	
142.	Waterway Bridge	10222	
143.	Waterway Bridge	10700	
144.	Waterway Bridge	11120	
145.	Waterway Bridge	11620.3	
146.	Waterway Bridge	12125	
147.	Waterway Bridge	12431.74	
148.	Waterway Bridge	13220	
149.	Waterway Bridge	13345.293	
150.	Waterway Bridge	13493	
151.	Waterway Bridge	13955	
152.	Waterway Bridge	14215	
153.	Waterway Bridge	15460	
154.	Waterway Bridge	15477.57	
155.	Waterway Bridge	16312.205	
156.	Waterway Bridge	16820	
157.	Waterway Bridge	17378	
158.	Waterway Bridge	18320	
159.	Waterway Bridge	19070	
160.	Waterway Bridge	19604	
161.	Waterway Bridge	20196	

S. No.	Intermediate Structures	Chainage (m)	No.
162.	Waterway Bridge	20813.233	
163.	Waterway Bridge	20850	
164.	Waterway Bridge	21112	
165.	Waterway Bridge	21200	
166.	Waterway Bridge	21530	
167.	Waterway Bridge	21790	
168.	Waterway Bridge	22075	
169.	Waterway Bridge	22270	
170.	Waterway Bridge	27658.288	
171.	Waterway Bridge	31020	
172.	Waterway Bridge	33400	
173.	Waterway Bridge	34010	
174.	Waterway Bridge	34920	
175.	Waterway Bridge	35560	
176.	Waterway Bridge	36860	
177.	Waterway Bridge	37090	
178.	Waterway Bridge	38760	
179.	Waterway Bridge	40970	
180.	Waterway Bridge	41051.682	
181.	Waterway Bridge	41458.488	
182.	Waterway Bridge	43570	
183.	Waterway Bridge	44690	
184.	Waterway Bridge	45690	
185.	Waterway Bridge	47305.231	
186.	Waterway Bridge	48510	
187.	Waterway Bridge	49280	
188.	Waterway Bridge	49920	
189.	Waterway Bridge	50820	
190.	Waterway Bridge	51260	
191.	Waterway Bridge	51870	
192.	Waterway Bridge	52513	
193.	Waterway Bridge	52894	
194.	Waterway Bridge	53434	
195.	Waterway Bridge	53680	
196.	Waterway Bridge	54320	
197.	Waterway Bridge	55330	
198.	Waterway Bridge	56260	
199.	Waterway Bridge	57005	
200.	Waterway Bridge	57707	
201.	Waterway Bridge	58040	
202.	Waterway Bridge	58540	
203.	Waterway Bridge	59150	
204.	Waterway Bridge	59820	
205.	Waterway Bridge	61060	

S. No.	Intermediate Structures	Chainage (m)	No.
206.	Waterway Bridge	62650	
207.	Waterway Bridge	63020	
208.	Waterway Bridge	63890	
209.	Waterway Bridge	64003	
210.	Waterway Bridge	64140	
211.	Waterway Bridge	64860	
212.	Waterway Bridge	65793	
213.	Waterway Bridge	66030	
214.	Waterway Bridge	66530	
215.	Waterway Bridge	66704.473	
216.	Waterway Bridge	67170	
217.	Waterway Bridge	67330	
218.	Waterway Bridge	68320	
219.	Waterway Bridge	69340	
220.	Waterway Bridge	69920	
221.	Waterway Bridge	70098	
222.	Waterway Bridge	70340	
223.	Waterway Bridge	70647	
224.	Waterway Bridge	70919	
225.	Waterway Bridge	71012	
226.	Waterway Bridge	71270	
227.	Waterway Bridge	71318.324	
228.	Waterway Bridge	71385.738	
229.	Waterway Bridge	71420	
230.	Waterway Bridge	72210	
231.	Waterway Bridge	72730	
232.	Waterway Bridge	72928.774	
233.	Waterway Bridge	73110	
234.	Waterway Bridge	73650	
235.	Waterway Bridge	73860	
236.	Waterway Bridge	74380	
237.	Waterway Bridge	74410.26	
238.	Waterway Bridge	74490	
239.	Waterway Bridge	74565.938	
240.	Waterway Bridge	74727.935	
241.	Waterway Bridge	74890	
242.	Waterway Bridge	75515	
243.	Waterway Bridge	75870	
244.	Waterway Bridge	76500	
245.	Waterway Bridge	77224	
246.	Waterway Bridge	78020	
247.	Waterway Bridge	78420	
248.	Waterway Bridge	79290	
249.	Waterway Bridge	79921.892	

S. No.	Intermediate Structures	Chainage (m)	No.
250.	Waterway Bridge	80380	
251.	Waterway Bridge	80827.204	
252.	Waterway Bridge	80970	
253.	Waterway Bridge	81860.528	
254.	Waterway Bridge	82030	
255.	Waterway Bridge	82410	
256.	Waterway Bridge	82660	
257.	Waterway Bridge	82864.696	
258.	Waterway Bridge	83170	
259.	Waterway Bridge	83806.492	
260.	Waterway Bridge	84390	
261.	Waterway Bridge	85050	
262.	Waterway Bridge	85730	
263.	Waterway Bridge	85758	
264.	Waterway Bridge	86250	
265.	Waterway Bridge	86890	
266.	Waterway Bridge	87583	
267.	Waterway Bridge	87814	
268.	Waterway Bridge	88365	
269.	Waterway Bridge	88740	
270.	Waterway Bridge	89823	
271.	Waterway Bridge	89960	
272.	Waterway Bridge	90590	
273.	Waterway Bridge	90942	
274.	Waterway Bridge	93187	
275.	Waterway Bridge	93625.14	
276.	Waterway Bridge	94180	
277.	Waterway Bridge	94900	
278.	Waterway Bridge	95430	
279.	Waterway Bridge	96250.593	
280.	Waterway Bridge	96560	
281.	Waterway Bridge	97500	
282.	Waterway Bridge	98900	
283.	Waterway Bridge	99372	
284.	Waterway Bridge	100004.35	
285.	Waterway Bridge	100430	
286.	Waterway Bridge	101340	
287.	Waterway Bridge	102040	
288.	Waterway Bridge	103060	
289.	Waterway Bridge	104230	
290.	Waterway Bridge	105160	
291.	Waterway Bridge	105680	
292.	Waterway Bridge	106200	
293.	Waterway Bridge	107328.6	

S. No.	Intermediate Structures	Chainage (m)	No.
294.	Waterway Bridge	108894.76	
295.	Waterway Bridge	109720	
296.	Waterway Bridge	110150	
297.	Waterway Bridge	110201	
298.	Waterway Bridge	110637.7	
299.	Waterway Bridge	111532.72	
300.	Waterway Bridge	112230	
301.	Waterway Bridge	112947	
302.	Waterway Bridge	113580	
303.	Waterway Bridge	113840	
304.	Waterway Bridge	114820	
305.	Waterway Bridge	115174	
306.	Waterway Bridge	115210	
307.	Waterway Bridge	115904	
308.	Waterway Bridge	116320	
309.	Waterway Bridge	116742	
310.	Waterway Bridge	117910	
311.	Waterway Bridge	118594	
312.	Waterway Bridge	119560	
313.	Waterway Bridge	119955	

Source: HRIDC

2.14.5 Stations, Supervisory and Administrative Offices

Drawings issued by RDSO were used for quantity estimations rates given in Northern Railway USSOR 2010 and the last accepted rates from the contract agreements have been used to arrive at the rate of items. Typical station building design is given in **Annexure 2.6**.

2.14.6 Signalling and Telecommunication System

- All stations shall be class-B type with Standard-III interlocking having Electronic Interlocking, multi aspect LED based color light signaling, electrically operated point machine and DC track circuiting for detection of track section.
- For Block working, it is proposed to provide UFSBI token less Block instrument along with bell equipment as per latest RDSO specification. The block instrument will be connected to the interlocking system.
- In order to improve system reliability, the provision of integrated power supply system has been considered. This will have an added advantage of ensuring uninterrupted power supply round the clock, preventing signal going blank.
- Provision of optical fibre based communication system has been planned for complete section

2.14.7 Cost Estimate

The overall capital cost for Haryana Orbital Rail Corridor including land cost is given in **Table 2.10**. The criteria based on which the cost for Signalling, operation & maintenance is designed is attached as

Annexure 2.7.**Table 2.10: Overall Capital Cost for Haryana Orbital Rail Corridor (HORC)**

S. No.	Description	Cost (in Crores)
1	Civil Engineering	3357.77
2	Signaling and Telecommunication	161.46
3	Over Head Electrification and General Electrical	348.79
Total Construction cost		3868.02
4	Land* Cost including Rehabilitation and resettlement	1358.67
5	Interest During Construction (IDC)	391.00
Total Cost (In Crores)		5617.69
6	Revenue from PD/TOD upfront	795.00
Net Cost		4822.69

Source: DPR of Project

*In addition, Land belonging to Indian Railway, DFCCIL and Government of Haryana shall be taken free of Cost.

2.15 FINANCIAL & IMPLEMENTATION ASPECTS OF THE PROJECT

Financial and implementation aspects of the project are as follows:

- Estimation of Traffic Revenues;
- Passenger Earnings;
- Freight Earnings.

Assessment of Economic Cost

As per DPR, the cost components of the project are:

- Capital Cost of the Project - which are computed on the basis of depreciation and amortization charges of the Project, which reflect the annual capital cost for the Project;
- Operating Cost of the Project - which are the operations and maintenance costs derived from our analysis and survey.

Assessment of Economic Benefit

The assessment of economic benefit is as follows:

- Reduction in Pollution (Greenhouse gas) emissions due to more efficient transport option;
- Land Freement;
- Potential for development of new production bases and townships along the corridor;
- Major connectivity boost to less developed areas along the corridor;
- Benefits due to Increased Employment and Household spending;
- Boost to construction activity, technological enhancement of Railways, long term infrastructure development;
- Development of State of the Art manufacturing and software ecosystem.

2.16 IMPLEMENTATION SCHEDULE AND PACKAGING DETAILS

To facilitate Phase wise commissioning of the HORC project, with corresponding Revenue generation and facilitating sanction of part loan from AIB, the overall project is proposed to be divided into two phases as follows:

- Phase-I: from km 32.00 to km 61.5 (broadly between Dhulawat- Badsa stations) and 11.4 route length connectivities (i.e Manesar to Patli, New Patli to Patli and New Patli to Sultanpur).
- Phase-II: Balance portion of HORC.
- The Phase-I of the project has been further sub-divided into Phase IA, Phase IB and Phase IC
 - ✓ **Phase IA:** Commissioning from Km 49.7 to Km 55.6 including connectivity from Manesar to Patli
 - ✓ **Phase IB:** Commissioning from Km 55.60 to Km 61.50 including connectivities from New Patli to Patli and New Patli to Sultanpur
 - ✓ **Phase IC:** Commissioning from Km 32.00 to Km 49.

The packaging details for proposed HORC project is given in **Table 2.11**.

Table 2.11: Packaging Details for Proposed HORC Project

S.No.	Package No.	Description	Scheduled Dates		
			Tender Invitation (MM/YY)	Tender Receiving (MM/YY)	Contract Signing (MM/YY)
Phase-I (from Km 32.00 to Km 61.50 and 11.4 km Route length connectivities)					
1	HORC/GC/2020/01	General Consultancy Services for Haryana Orbital Rail Corridor (HORC) (REOI, RFP, Construction Phase and Operation & maintenance)	Nov-20	Dec-20	Mar-21
2	C-1	Priority section: Construction of Earthwork, Bridges, Station Buildings, Retaining Walls and other miscellaneous Works in Connection with laying of New BG Double Railway Line of HORC project from Km 49.70 to Km 55.60 and its connectivity (new BG single line) from proposed Manesar Station of HORC to existing Patli Railway Station of IR Network	Nov-21	Jan-22	May-22
3	Br-1	Fabrication, assembly & launching of 1X76.2m span Open Web Girder on NH-352 W (Pataudi Road) at Km . 54.498 including supplying & fixing of H-beam sleepers in Connection with laying of New BG Double Railway Line of HORC project	Mar-22	Apr-22	Jun-22

S.No.	Package No.	Description	Scheduled Dates		
			Tender Invitation (MM/YY)	Tender Receiving (MM/YY)	Contract Signing (MM/YY)
4	T-1	Laying of Track and track related works including supply of ballast, special sleepers, switches and crossings, track fittings but excluding supply of Rails and main line Sleepers in Connection with laying of New BG Double Railway Line of HORC project from Km 32.00 to Km 61.50 and its connectivities to IR network from proposed Manesar to Patli and proposed New Patli to Patli & Sultanpur including modifications in Patli and Sultanpur station yards.	Mar-22	Apr-22	Jun-22
5	C-2	Composite Contract Package for Design and Construction of Civil Works (Earthwork, Bridges, Station Buildings, Retaining Walls and other miscellaneous Works) from Km 55.60 to Km 61.50 and its connectivities to IR network from proposed New Patli to Patli & New Patli Sultanpur and Design, Supply, installation and Testing & Commissioning of OHE (1x25KV), general electrical services and Signalling & Telecommunication from Km 49.70 to Km 61.5 and its connectivities to IR network from proposed Manesar to Patli and New Patli to Patli & New Patli to Sultanpur including modifications in Patli and Sultanpur station yards in Connection with laying of New BG Double Railway Line of HORC project.	Apr-22	Jun-22	Sep-22
6	C-3	Composite Contract Package for Design and Construction of Civil Works (Earthwork, Bridges, Station Buildings, Retaining Walls and other miscellaneous Works), Design, Supply, installation and Testing & Commissioning of OHE (1x25KV), general electrical services and Signalling & Telecommunication in Connection with laying of New BG Double Railway Line of HORC project from Km 29.20 to Km 49.7	Jun-22	Jul-22	Oct-22

Phase-II (from Km 0.00 to Km 32.00 and Km 61.50 to Km 125.98 and 6.29 km Route length connectivities)

1	C-4*	Composite Contract package for Construction of Tunnel (from Km	Jun-22	Aug-22	Nov-22
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S.No.	Package No.	Description	Scheduled Dates		
			Tender Invitation (MM/YY)	Tender Receiving (MM/YY)	Contract Signing (MM/YY)
		24.87 to Km 29.06) including installation of Ballast Less Track (exlcuding supply of rails) , Supply, installation and Testing & Commissioning of OHE (1x25KV), general electrical services and Signalliling & Telecommunication in tunnel portion from Km 24.87 to Km 29.20 and construction of Embankment, Bridges, Retaining walls and other miscellaneous works from Km 29.06 to Km 29.20 and Km 12.00 to 18.00 Km in Connection with laying of New BG Double Railway Line of HORC project			
2	C-5	Composite Contract pacakge for Deisgn and Construction of Viaduct (Km 21.33 to Km 24.87), Civil works (Earthwork, , Bridges, Retaining Walls & other miscellaneous Works) from Km 0.00 to Km 12.00 and Km 18.00 to Km 21.33 and Design, Supply, installation and Testing & Commissioning of OHE (1x25KV), general electrical services and Signalliling & Telecommunication from Km 0.00 to Km 24.87 in Connection with laying of New BG Double Railway Line of HORC project and its connectivity to New Prithla station on DFC network including modifications in New Prithla Station yard.	Jul-22	Sep-22	Dec-22
3	C-6	Composite Contract Package for Design and Construction of Civil Works (Earthwork, Bridges, Station Buildings, Retaining Walls and other miscellaneous Works), Design, Supply, installation and Testing & Commissioning of OHE (1x25KV), general electrical services and Signalliling & Telecommunication in Connection with laying of New BG Double Railway Line of HORC project from Km 61.5 to Km 125.98 and its connectivities to stations on IR network from proposed Badsa to Sultanpur and proposed Mandothi to Asaudha including modifications in Asaudha Station yard.	Aug-22	Nov-22	Feb-23

S.No.	Package No.	Description	Scheduled Dates		
			Tender Invitation (MM/YY)	Tender Receiving (MM/YY)	Contract Signing (MM/YY)
4	T-2	Design, Supply and Laying of Track and Track related Works in Connection with laying of New BG Double Railway Line of HARC project from Km 0.00 to Km 24.87 , Km 29.20 to Km 32.00 and Km 61.50 to Km 125.98 including its connectivities to stations on DFC/ IR network from proposed Prithla to New Prithla, proposed Badsa to Sultanpur and proposed Mandothi to Asaudha including modifications in New Prithla & Asaudha station yards.	Sep-22	Dec-22	Mar-23

Plate 2.1 View of the Study Area



Pirthala Railway Yard (start point of alignment)



Harsana Kalan Railway Station (End point of alignment)



Delhi Rohtak Railway line



Agriculture field near proposed Badli Station



Agriculture field near Maneshar Gurugram



Lake of Sultanpur National Park



Wetland area near village Bhopnai



Canals of the study area

CHAPTER – 3

LEGAL POLICY AND REGULATORY FRAMEWORK

3.1 INTRODUCTION

This chapter presents a review of legislations and policy of AIBB relevant to this project at the National and State levels. Regulations, relevant procedures and requirements that may directly affect the project, the capacity of the concerned institutions and their ability to successfully implement the environmental management measures have been addressed in this chapter. This chapter also outlines various issues related to the framework in place for environmental clearance of projects with reference to the central government and state government of Haryana.

Environmental Protection cannot be isolated from the general issues of development. To achieve progress in all spheres of human development, economy, technology, industrial production, infrastructure development, and health care should balance with environmental protection. Over the years, together with spreading of environmental consciousness, there has been a change in the traditionally held perception that there is a trade-off between environmental quality and economic growth as people have come to believe that the two are necessary complimentary.

The need for a well-developed legal mechanism is to conserve resources, protect the environment and to ensure the health and well- being of the people nearby the proposed alignment. Keeping the pace with international laws, the Ministry of Environment and Forest enacted Environmental Protection Act in 1986. Over the years, the Government of India has framed several policies and promulgated number of Acts, Rules and Notifications aimed at management and protection of the environment. During last three decades an extensive network of environmental legislation has grown and presently it has a fairly complex body of environmental legislation aimed at ensuring that the development process meets the overall objective of promoting sustainability in the long run.

3.2 GOVERNMENT OF INDIA'S REQUIREMENTS

(A) Environment Clearance Requirements

As per MoEF&CC notification dated 14th September 2006 and its amendment till date, Railway projects do not require environmental clearance.

(B) Forest Clearance Requirements

As per MoEF&CC notification (F. No. 11 – 353/2016-FC dated Jan. 17, 2017), the linear or strip plantation along road, rail and canal are declared as protected forest and it is managed by forest department. The forest land along the linear or strip plantation is required for purpose other than the purpose for which the land was acquired even by the same department owning the land then equivalent non forest land has to be provided by the user agency for compensatory afforestation. The compensatory afforestation shall be raised over degraded forest land twice in extent of the forest area being diverted for the purpose of Forest Conservation Act, 1980.

3.3 APPLICABLE NATIONAL ENVIRONMENT POLICIES AND REGULATIONS

3.3.1 The Environment (Protection) Act, 1986

Act was enacted with the objective of providing for the protection and improvement of the environment. It empowers the Central Government to establish authorities [under section 3(3)] charged with the mandate of preventing environmental pollution in all its forms and to tackle specific environmental problems that are peculiar to different parts of the country. Under this Act, the Central Government is empowered to take measures necessary to protect and improve the quality of the environment by setting standards for emissions and discharges. From time to time, the Central Government issues notifications under the EPA for the protection of ecologically-sensitive areas or issues guidelines for matters under the EPA.

3.3.2 EIA Notification 2006

EIA notification was initially issued by the MoEF&CC in 1994. In 2006 new EIA notification was issued based on re-engineered process. The EIA notification is governing all developmental interventions in the country. The purpose of this notification is to impose restrictions and prohibitions on the expansion and modernization of any activity or proposing a new project as specified in Schedule I of EIA notification 2006 in any part of India unless environmental clearance has been accorded by the Central Government or State Government in accordance with the procedure specified in the notification.

According to the EIA Notification 2006 and its amendments, railway and bridge construction projects do not appear in the list of Schedule and as such, are exempted from the environmental clearance process.

3.3.3 The Indian Forest Act, 1927

The Indian Forest Act, 1927 was enacted after repealing the Indian Forest Act, 1878 for the purpose of consolidating the law relating to forests, the transit of forest produce and the duty on timber and other forest produce. The Act makes various provisions for conservation of forests and also provides for the State Government to constitute any forest land or waste land as reserved forest which is the property of Government or over which the Government has proprietary rights, or the whole or any part of the forest produce of which the Government is entitled. The preamble and other provisions of the Forest Act are wide enough to cover all categories of forests like reserved forests, village forests, protected forests, etc.

3.3.4 Forest Act and its Amendments

a) Forest Conservation Act, 1980 and its Amendments

This Act provides for the conservation of forests and regulating diversion of forest lands for non-forest purposes activities. When any project falls within forest lands, prior clearance is required from the relevant authorities under the Forest (Conservation) Act, 1980. The respective State Governments cannot de-reserve any forestland or authorize its use for any non-forest purposes without approval from the Central Government. The forest authorities conduct a cost-benefit analysis to assess the loss of forest produce, loss to environment vis-à-vis benefits of project.

b) Forest Conservation Rules, 2003 and its Amendments

According to the Forest (Conservation) Rules, 2003 as amended up to February 2004, the project requires forestry clearance if forest land acquisition is involved. In case of forest land, if acquisition is less than 40 ha (other than mining project), decision will be taken by RCCF, and if acquisition is more than 40 ha, the proposal will be sent to Ministry of Environment, Forest & Climate change for their approval.

3.3.5 The Biological Diversity Act, 2002 and its Rules, 2004

This Act provides for the conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto. As per the provision of Act, certain areas which are rich in biodiversity and encompass unique and representative ecosystems are identified and designated as biosphere reserve to facilitate its conservation. All restrictions applicable to protected areas such as National Park and Sanctuaries are also applicable to the reserves.

3.3.6 The Wildlife (Protection) Act, 1972 and its Amendment

The Act provides for protection to the listed endangered flora and fauna and ecologically important protected areas. The Act was enacted with the objective of effectively protecting the wild life of the country and to control poaching, smuggling and illegal trade in wildlife and its derivatives. It empowers the Central and State Governments to declare any area as a wildlife sanctuary, national park or closed area. It provides for authorities to administer and implement the Act; regulate the hunting of wild animals; protect specified plants, sanctuaries, national parks and closed areas; restrict trade or commerce in wild animals or animal articles; and miscellaneous matters.

3.3.7 Noise Pollution (Regulation and Control Rules) 2000

The rules for noise pollution came into force in 2000 for considering the deleterious and psychological effects of the noise pollution on human well-being. According to the provisions of the Rules, a person could make a complaint to the designated authority in the event that the actual noise levels exceed the ambient noise standards by 10 dB (A) or more as compared to the standards prescribed. The above rules are applicable at the time of the execution of the project. The equipment used during the construction should have acoustic enclosure.

3.3.8 Air (Prevention and Control of Pollution) Act, 1981

Air Act provides for the prevention, control and abatement of air pollution. It is applied when air polluting activity in an air pollution control area or when emissions of any air pollutants into the atmosphere exceed the standards set by the Central and State Boards.

3.3.9 Water (Prevention and Control of Pollution) Act, 1974

The Act resulted in the establishment of the Central and State level Pollution Control Boards which responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of certain facilities.

3.3.10 Ancient Monuments & Archaeological Sites & Remains (Amendment and Validation) Act 2010

The Archaeological Survey of India (ASI) administers the Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010 to provide for prohibited and regulated areas around monuments of national importance. According to this act, the ancient monument, archaeological sites and remains should have a distance of 200m in all directions. Therefore, construction could be made only in accordance with the terms and conditions of the licence granted by the competent authority of the ASI. Conservation for the designated protected monuments/sites/remains is addressed by the existing legislation.

3.3.11 Cultural Environment Related Act, 1958

The Archaeological Survey of India is the primary organization for the archaeological researches and protection of the cultural heritage of the nation. Maintenance of ancient monuments and archaeological sites and remains of national importance is main concern of the organization. As a result of growing interest in cultural heritage in the nation, both government agencies and NGOs concerned with the preservation and conservation of heritage. It regulates all archaeological activities in the country as per the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958 as well as Antiquities and Art Treasure Act, 1972.

3.3.12 Regulation / Act governing Vibration

There is no regulation/standard in India governing train induced ground vibrations. Regulations/standards prevailing in other countries such as Japan, USA, and Sweden, etc. have been reviewed and compared with the findings of vibration monitoring in its baseline data chapter. Vibration Regulation Law in Japan issued by Ministry of the Environment, Government of Japan stipulates to preserve living environment and contribute to protection of the people's health by regulating vibration. As per this law, standards for vibration emitted from specified construction works and limits for motor vehicle vibration have been provided for different land use pattern.

3.3.13 Public Liability Insurance Act, 1991 and its Amendment, 1992

This Public Liability Insurance imposes on the owner the liability to provide immediate relief in respect of death or injury to any person or damage to any property resulting from an accident while handling any of the notified hazardous chemicals. This relief has to be provided on a "no fault" basis. Owner handling hazardous chemicals has to take an insurance policy of an amount equal to its "paid up capital" or up to Indian Rupees 500 million, whichever is less. The policy has to be renewed every year. New undertakings have to take this policy before the commencement of the activity. The owner also has to pay an amount equal to its annual premium to the Central Government's Environment Relief Fund (ERF). The payment under the Act is only for the immediate relief; owners shall have to provide the final compensation, if any, arising out of the legal proceedings.

3.3.14 National Green Tribunal Act, 2010

The National Green Tribunal (NGT) has been established on October 18, 2010 under the National Green Tribunal Act, 2010 for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and natural resources. It is a specialized judicial body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues. The Tribunal is not bound by the procedure laid down under the Code of Civil Procedure, 1908, but shall be guided

by the principles of natural justice. The Tribunal's dedicated jurisdiction in environmental matters is to provide speedy environmental justice and help reduce the burden of litigation in the higher courts.

3.3.15 Labour Laws

- Building and Other construction workers (Regulation and the Employment and conditions of service) Act, 1996
- Child labour (Prohibition and Regulation) Act, 1986

3.3.16 The National Environmental Policy (NEP), 2006

The NEP 2006 is a response to national commitment to clean environment mandated in the Indian Constitution and is intended to mainstream environmental concerns in all development activities with key objectives is to integrate environmental concerns into policies, plans, programmes and projects for economic and social development in Country. NEP recognizes environmental degradation as a major causal factor in enhancing and perpetuating poverty particularly among the rural poor. The policy has evolved from the recognition that only such development is sustainable, which respects environmental and ecological constraints. In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

3.3.17 National Forest Policies

The Ministry of Food and Agriculture formulated the National Forest Policy to be followed in the management of State Forests in the country long time back in 1952. As a result, the Forest Policy was revised in 1988 to review the situation and to evolve a new strategy of forest conservation in country. The principal aim of new Forest Policy is to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which is vital for sustenance of all life forms. The policy envisages in enhancing the forest coverage of the country to 33% of total geographical area of the country.

3.3.18 Hazardous and other Wastes (Management, Handling and Trans-boundary Movement) Rules, 2016

The management of hazardous waste is a complex set of rules which together combine to form the legal regime. The objective of these rules is to ensure environmentally sound management of all hazardous materials and to enable recovery and/or use of useful materials from hazardous waste destined for final disposal. The rules establish the responsibility for the safe and environmentally sound handling of environmental waste by any 'occupier' of hazardous waste. An occupier is a person who has under his charge, any plant or factory producing hazardous waste or who holds hazardous waste. 'Recycling' is defined as reclamation or reprocessing of hazardous waste in an environmentally sound manner for the original purpose or for other purposes.

3.3.19 MoEF&CC Eco-sensitive Area Notifications

Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India from time to time has brought out various Notifications on Eco-sensitive area across the country. These Notifications clearly mentions the prohibitive/ restricted activities and the minimum distance to be maintained for any sort of activities. These include non-establishment of any industrial unit adjacent to the eco-sensitive zone, no construction activities to be entertained in the vicinity and quarrying and mining to be strictly prohibited. In addition to the above activities tree felling, ground water extraction,

increased noise levels, discharge of effluent and solid waste disposal are also strictly restricted activities in the eco-sensitive areas.

3.3.20 Tree Felling Procedures in Haryana

Tree felling procedures for restriction and permission in Haryana are mostly governed by internal circulars and guidelines of the State Forest Department. Besides this, the Punjab Land Preservation Act, 1900 is also followed. Recently, seven trees are allowed for cutting without permission to promote agro-forestry in the State. These species are - Ailanthus (ulloo neem), bakain, amrood (guava), bamboo, tut (mulberry), Eucalyptus (safeda) and poplar. These species of plants are found and will have to be cut for proposed HORC alignment.

All Acts, Rules, their purpose, applicability and operational agencies are described in **Table 3.1**.

Table 3.1: Acts, Rules, Policy and Guideline

S. No.	Act/Rules	Purpose	Applicability	Yes/No	Authority
1	Environment Protection Act-1986	To protect and improve overall environment	The project activities should maintain emission standards	Yes	MoEF&CC. Gol; DoE, State Govt. CPCB; SPCB
2	Environmental Impact Assessment Notification- 2006	To provide environmental clearance to new development activities following environmental impact assessment	Railway projects are not included in the Notification of 14 th Sep, 2006 and EC under this Act is not applicable.	No	MoEF&CC/SEIAA
3	The Indian Forest Act, 1927 The Forest (Conservation) Act, 1980 The Forest (Conservation) Rule, 1981	To check tree felling deforestation by restricting conversion of forested areas into non- forested area	Applicable, as plantation parallel to existing track is declared as protective forest.	Yes	MoEF&CC and State Forest Departments
4	MoEF circular (1998) on linear Plantation on roadside, canals and railway lines modifying the applicability of provisions of Forest (Conversations) Act to linear Plantation	Protection / planting roadside strip as avenue/strip plantations as these are declared protected forest areas.	Applicability of Forest (Conservation) Act to Roadside and rail side strip Plantations	Yes	MoEF&CC and State Forest Departments
4	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution by specifying the emission standards.	Emissions from construction machinery and vehicle should be Checked time to time	Yes	State Pollution Control Board of Haryana
5	Water Prevention and Control of Pollution) Act, 1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Various parameters in effluents from construction sites and workshops are to be kept below the prescribed standards	Yes	State Pollution Control Board of Haryana

S. No.	Act/Rules	Purpose	Applicability	Yes/No	Authority
6	Noise Pollution (Regulation and Control Act), 2000	The standards for noise for day and night have been promulgated by the MoEF&CC for various land uses	DG sets at construction sites and workshops should be provided with acoustics enclosures.	Yes	State Pollution Control Board of Haryana
7	Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	Conservation of cultural and historical remains found in India	No ASI monument is located within 300m from proposed HORC track on either side But 'chance find', if any, shall be governed by the Act & to be surrendered to Competent Authority	No	Monuments Authority of India
8	The Explosives Act, 1884	Safe transportation, storage and use of explosive material.	Respective Authorization shall be obtained From CCoE	Yes	Chief Controller of Explosives CCoE
9	Minor Mineral and Concession Rules, The Mining Act	For opening new borrow pits & quarry.	Quarry Licenses shall be obtained by Contractors.	Yes	District Collector/ Mining authority of the area
10	Central Motor Vehicle Act, 1988 and Central Motor Vehicle Rules, 1989	To check vehicular air and noise pollution and authorization to drive vehicle.	All vehicles in Use shall obtain Pollution Control Check certificates and shall be driven by personnel with proper license.	Yes	Motor Vehicle Department of the state
11	The Mining Act	For safe & sound mining activity	Quarry license to obtain by the Contractor.	Yes	State Govt. Deptt. of Mines
12	Hazardous and other waste (Management and Tran boundary Movement) Rules, 2016	Management and storage of hazardous waste	Applicable	Yes	MoEF&CC/ State Pollution Control Board of Haryana
13	The Railway Act 1989	Land acquisition	Applicable	Yes	GoI
14	The Petroleum (Amendment) Rules 2011	Use and storage petroleum of products	Applicable	Yes	CCOE/District Collector of the area

S. No.	Act/Rules	Purpose	Applicability	Yes/No	Authority
15	Solid Municipal Wastes Management Rules, 2016	Management & disposal of Construction & Demolition debris	Applicable	Yes	State Pollution Control Board of Haryana
16	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013	Compensation for land owners (First Schedule), Rehabilitation and resettlement entitlements (Second Schedule), and Provision of infrastructural facilities (Third Schedule) of this Act shall be applicable	Applicable	Yes	GoI
17	Gazette Notification No. S.O.-3/C.A. 30/2013/S. 30/2018 dated 23 rd January 2018, Revenue and Disaster Management Department, Haryana Government	Land valuation	Applicable	Yes	GoH
18	The Right to Information Act, 2005	The Act provides for setting out the practical regime of right to information for citizens to secure access to information under the control of public authorities. PAPs can avail the required information from the HRIDC and district administration.	Applicable	Yes	GoI
19	Minimum Wages Act, 1948	An Act to provide for fixing minimum rates of wages in certain employments	Applicable	Yes	GoI
20	Equal Remuneration Act, 1976	Equal remuneration for equal competency without	Applicable	Yes	GoI

S. No.	Act/Rules	Purpose	Applicability	Yes/No	Authority
		discrimination of gender, cast and creed.			
21	The Child and Adolescent Labour (Prohibition and Regulation) Act, 1986	An Act to prohibit the engagement of children in any occupations and to prohibit the engagement of adolescents in hazardous occupations	Applicable	Yes	GoI
22	Building and Other construction workers (Regulation and the Employment and conditions of service) Act, 1996	To regulate the employment and conditions of service of building and other construction workers and to provide safety, health and welfare to workers	Applicable	Yes	Ministry of Labour and Employment
23	CLRA/ Contract Labour (Regulation and Abolition) Act, 1970	To regulate contract labour in establishments and provides for its abolition in certain circumstances.	Applicable	Yes	Chief labour commissioner (Central)
24	The Rights of Persons With Disability Act, 2016	For enjoyment of all human rights by peoples with disabilities.	Applicable	Yes	Ministry of Law and Justice
25	The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	To regulate the condition of service of inter-state labourers in Indian labour law.	Applicable	Yes	Parliament of India
26	The Sexual Harassment of Women at Workplace(Prevention,Prohibition and Redressal) Act,2013	To provide protection against sexual harassment of women at workplace and for the prevention and redressal of	Applicable	Yes	District Officer

S. No.	Act/Rules	Purpose	Applicability	Yes/No	Authority
		complaints of sexual harassment.			

3.4 ENVIRONMENT CLEARANCE REQUIREMENTS FOR THE PROJECT

Various environment clearances required during different stages of project along with statutory authorities, time period and responsibility is given in Table 3.2.

Table 3.2: Applicable Permits and Clearances Required for the Project

S. No	Required Clearance	Statutory Authority	Applicability	Project stage	Time required	Responsibility
1	Forest Clearance	State Department of Environment and Forest and MOEF&CC	Applicable, because the plantation along road, canal and railway side falls under protected forest.	Pre-construction	6 months	HRIDC
2	Tree felling permission	State Forest department	Felling of trees	Pre-construction	1 Month	HRIDC
3	NOC and Consents Under (Air, Water) Environment Protection Acts & Noise rules of SPCB	State Pollution Control Board	For establishing batching plants	Construction (Prior to work initiation)	4 months	Contractor
4	Permission to store Hazardous Materials	State Pollution Control Board	Storage and Transportation of Hazardous Materials and Explosives	Construction (Prior to work initiation)	2-3 months	Contractor
5	Explosive license	Chief controller of explosives	Storage of explosive materials	Construction (Prior to work	2-3 months	Contractor

S. No	Required Clearance	Statutory Authority	Applicability	Project stage	Time required	Responsibility
6	PUC certificate for use of vehicles for construction	Department of Transport	For all construction vehicles	Construction (Prior to work initiation)	Regular	Contractor
7	Quarry lease deeds and license	Dept. of Geology and Mines	Quarrying and borrowing operations	Construction (Prior to work initiation)	2-3 months	Contractor
8	NOC for water extraction for construction and allied works	Ground Water Authority	Ground water extraction	Construction (Prior to work initiation)	3 Months	Contractor
9	Permission to withdraw water for construction from surface water sources such as rivers	Irrigation Department	For withdraw water from surface water sources such as rivers	Pre - construction	1 Month	Contractor
10	Permission to Establish Construction camps	District Magistrates of respective districts	For Construction camps	Construction	1 Month	Contractor
11	Pollution Under Control Certificate	Traffic Police Department and District Administration	Central Motor and vehicle Act 1988	Construction	1 Month	Contractor
12	Employing Labour/Workers	District Labour Commissioner	The Building and Other Construction Workers (Regulation and Employment Conditions of Service) Act, 1996	Construction	1 Month	Contractor
13	Traffic Management and Regulation during construction and maintenance	Traffic Police Department and District Administration	National Road Safety Policy and Guidelines of Indian Roads Congress	Construction	1 Month	Contractor

3.5 APPLICABLE ENVIRONMENTAL INTERNATIONAL TREATIES AND STANDARDS

International Treaties and Standard which is applicable for proposed HORC project is given in **Table 3.3** below. The various standards adopted for the project i.e. GoI/WB/IFC i.e air quality standards; noise quality standards water standards and vibration standards are given in chapter 4.

Table 3.3: Applicable Environmental International Treaties and Standard

S. No.	Particulars	Purpose	Applicability	Relevance to Project
International Treaties				
1.	International Union for Conservation of Nature (IUCN)	Global authority on the status of the natural world	Applicable	Status of RET floral and faunal species in proposed project
2	Convention on International Trade in Endangered Species of Wild Fauna and Flora	Endangered status of prominent flora and fauna species	Applicable	Trade in wild animals and plants crosses borders between countries if any
3	Birdlife International	Conservation status of bird species	Applicable	As Sultanpur National Park is famous wetland
4	World Bank Group	Environmental parameter	Applicable	Air, Water, Noise, Soil and Vibration
Standards				
1.	International Finance Corporation (IFC)	Economic Development	Applicable	IFC guidelines for baseline environment data
2.	American Public Health Association (APHA)	Standard Methods for the Examination of water quality	Applicable	Health of all people and all communities
3.	United States Department of Agriculture (USDA)	Analysis Methodology of Soil Samples	Applicable	Analysis of Soil Samples
4.	International Standards (IS)	Calibration of test methods	Applicable	Marinating standard for groups
5	Central pollution Control Board (CPCB)	Quality standard for Air, Water, Noise	Applicable	Prevention and Control of Pollution
6	World Health Organization (WHO)	Health issue	Applicable	Monitoring public health risks

3.6 APPLICABLE LAWS AND POLICIES FOR SIA

3.6.1 The Railways Act, 1989

- The Act came into force in 1989, replacing the Railways Act of 1890. The Act provides in detail the legislative provisions regarding railway zones, construction and maintenance of works, land acquisition for special railway project, passenger and employee services.
- The Act, has been prepared for execution of special railway project, notified as such by the Central Government from time to time, to provide national infrastructure for a public purpose in a specified time-frame, covering one or more states or Union Territories. The main elements of the Railways Act 1989 are provided in the **Table 3.4**. The law is applicable as private land required for the project shall be acquired as per the provisions of this Act.

Table 3.4: Main Elements of The Railways Act,1989

Sections		Descriptions
20A	Power to acquire land	Declaration of intention to acquire land required for execution of a special railway project. This is the first notification and empowers the competent authority to trigger the substance of the notification.
20D	Hearing of objections etc.	Objections are to be made by the interested persons within 30 days from the date of publication of the notification under subsection (1) of section 20A.
20E	Declaration of acquisition	After the publication of the declaration under subsection(1), the land shall vest absolutely with the Central Government free from all encumbrances.
20F	Determination of amount payable as compensation	Amount to be paid as compensation shall be declared by an order of the competent authority. The competent authority shall make an award under this section within a period of one year from the date of publication of the declaration.
20F (6)	Arbitrations	If the amount determined is not acceptable to either of the parties, they can ask for arbitration and an arbitrator shall be appointed for this purpose.
20G	Criterion for determination of market value of land	(i) The minimum land value, if any, specified in the Indian Stamp Act, 1899 for the registration of sale deeds in the area, where the land is situated; or (ii) the average of the sale price for similar type of land situated in the village or vicinity, ascertained from not less than 50% of the sale deeds registered during three years, where higher price has

Sections		Descriptions
		been paid, whichever is higher.
20I	Power to take possession	To surrender or deliver possession thereof to the competent authority or any person duly authorized by it in this behalf within a period of 60 days of the service of the notice.

3.6.2 Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act 2013

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013 provides for land acquisition as well as rehabilitation and resettlement. It replaces the Land Acquisition Act, 1894 and the effective date is 1st January 2014.

The RFCTLARR Act 2013 will be followed for compensation based on market value, multiplier and solatium; resettlement and rehabilitation (R&R) entitlements to land owners and livelihood losers; and facilities at resettlement sites for displaced persons, besides providing flexibility to states and implementing agencies to provide higher norms for compensation and R&R. It also provides for the baseline for compensation and has devised a sliding scale which allows States to fix the multiplier (which will determine the final award) depending on distance from urban centers. The aims and objectives of the Act are as follows:

- a) To ensure, participative, informed and transparent process for land acquisition.
- b) Provide just and fair compensation to the affected families whose land has been acquired or proposed to be acquired or already affected by such acquisition.
- c) Make provisions for affected persons for their rehabilitation and resettlement.
- d) Ensure that outcome of obligatory acquisition which would lead to an improvement in their post-acquisition social and economic status.

3.6.3 The Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement (Haryana Amendment) Act, 2017

The RFCTLARR (Haryana Amendment) Act 2017 is an Act further to amend the RFCTLARR Act, 2013, in its application to the State of Haryana. Section 101(A) of this Act empowers the state government to de-notify land acquired under the Land Acquisition Act, 1894, if the public purpose for which it was acquired becomes unviable or unnecessary. It also says that where a part of the acquired land has been utilized or any encumbrances have been created, the land owner may be compensated by providing alternative land along with payment of damages, if any, as determined by the state government.

3.6.4 Railways Circular No. E (NG) II/2010/RC-5/1 dated 11.11.2019

Contents of Railways Circular No. E (NG) II/2010/RC-5/1 dated 11.11.2019 have been included in the extract below-

1. *On notification of Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013 (Removal of Difficulties) Order 2015 dated 28.08.2015, provisions of RFCTLARR Act 2013 related to determination of compensation in accordance with First, Second and Third Schedules of the RFCTLARR Act 2013 have become applicable to all cases of land acquisition under the Railways Act 1989 also. This inter alia means that, irrespective of whether land acquisition for Railway projects is done through Railways Act 1989 after declaring it as a Special Railway Project or through RFCTLARR Act 2013 through State Governments, determination of compensation shall be in accordance with First, Second and Third Schedules of the RFCTLARR Act 2013.*
2. *The modalities for implementation of Serial No. 4 of the Second schedule of the RFCTLARR Act 2013 were examined by Ministry of Railways and it has been decided that:*
 - I. *Ministry of Railways' earlier policy of offering appointment in Railways to affected land-losers issued vide references above is withdrawn and circulars issued in this regard vide reference above stand superseded.*
 - II. *Lump sum payment of Rs. 5 Lakhs to be provided to affected families who were primarily dependent on acquired land for livelihood, i.e., cases where their livelihood is affected by such acquisition or where entire land-holding of the affected family have been acquired.*
3. *Before considering grant of any relief under Second Schedule, however, the Competent Authority for Land Acquisition (CALA) or Collector should unequivocally certify that the affected family has been displaced and dislocated to another area or their entire land holding has been acquired. Further, in case of joint ownership of a plot of land, lump sum payment of Rs. 5 Lakhs should be shared between joint owners of plot in same ratio in which land value is to be shared.*
4. *This may be brought to the notice of all concerned authorities dealing with the acquisition of land and ensure that all determination of compensation for acquisition of land under the Railways Act, 1989 are in consonance with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCTLARR) Act, 2013.*
5. *This policy shall be effective from the date of issue of this letter.*

3.6.5 State Government Orders/Notifications

Gazette Notification No. S.O.-3/C.A. 30/2013/S. 30/2018 dated 23rd January 2018, Revenue and Disaster Management Department, Haryana Government:

The Governor of Haryana notified that when any land to be acquired for the project is situated in rural areas, the market value as calculated by the Collector as per sub-section (1) of section 26 of the RFCTLARR Act, 2013 shall be multiplied by the factor

Table 3.5: Multiplying Factor for Concerned DLC Rates

S. No.	Shortest/crow fly/radial distance from the outer boundary of any of the Urban Area in the State to any part of the particular Killa or part thereof, as the case may be, of the land to be acquired	Factor by which the market value is to be multiplied in case of rural areas
1.	Up to 10 Km	1.25
2.	Above 10Km and up to 20Km	1.50
3.	Above 20Km and up to 30Km	1.75
4.	Above 30 Km	2.00

The above distance shall be considered by shortest/crow fly/radial distances from the outer boundary of any of the Urban Area in the State to any part of the particular Killa or part thereof, as the case may be, of the land to be acquired. This notification shall be applicable for computing the compensation amount of land acquired. The R&R Entitlements are indicated in the Schedule 2 of the Act 2013.

3.6.6 Other Relevant Acts and Policies

- Minimum Wages Act, 1948
- Contract Labour Act, 1970
- Child Labour (Prohibition and Regulation) Act 1996 along with Rules, 1988
- Children (Pledging of Labour) Act, 1933 (as amended in 2002)
- The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 and Rules 1996.
- Untouchability Offences Act, 1955
 - The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act, 1989 and Rules 1995
- Right to Information Act, 2005
- Equal Remuneration Act, 1976
- The Sexual Harassment of Women at Workplace(Prevention,Prohibition and Redressal) Act,2013

3.7 Asian Infrastructure Investment Bank (AIIB) Guidelines for Environmental and Social Framework February 2016

Asian Infrastructure Investment Bank (AIIB) considers environmental and social considerations as environmental impacts on air, water, soil, ecosystem, fauna and flora as well as social impacts including

involuntary resettlement and respect for human rights of indigenous people and so on. Environmental Impact Assessment by AIIB means evaluating environmental and social impacts that projects are likely to have, analysing alternative plans and preparing adequate mitigation measures and monitoring plans in accordance with laws or guidelines of the recipient governments.

While project proponents etc. bear the ultimate responsibility for the environmental and social considerations of projects, AIIB supports and examines appropriate environmental and social considerations undertaken by project proponents to avoid or minimize development projects' impacts on the environment and local communities, and to prevent the occurrence of unacceptable adverse impacts. AIIB thus promotes sustainable development in developing countries. In these guidelines, AIIB has created clear requirements regarding environmental and social considerations, which project proponents must meet. AIIB provides project proponents with support in order to facilitate the achievement of these requirements through the preparation and implementation of cooperation projects. AIIB examines undertakings by project proponents in accordance with the requirements, and makes adequate decisions regarding environmental and social considerations on the basis of examination results. The detail of AIIB ESS framework is available at https://www.aiib.org/en/policies-strategies/_download/environment-framework/Final-ESF-Mar-14-2019-Final-P.pdf. Brief description of Environmental and Social Standards and their applicability is provided below:

ESS1: Environmental and Social Assessment and Management

Generally, the Bank requires an integrated approach to the process of environmental and social assessment relating to these risks and impacts, and design appropriate measures to avoid, minimize, mitigate, offset or compensate for them. ESS1 is applicable.

ESS 2: Involuntary Resettlement

The Bank encourages projects to avoid Involuntary Resettlement wherever possible; to minimize Involuntary Resettlement by exploring Project alternatives. Where avoidance of Involuntary Resettlement is not feasible, the Project/Borrower should enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-Project levels; to improve the overall socioeconomic status of the displaced poor and other vulnerable groups; and to conceive and implement resettlement activities as sustainable development programs, providing sufficient resources to enable the persons displaced by the Project to share in Project benefits. ESS2 also requires to improve the standards of living of the poor and other vulnerable groups displaced by the Project, including women, children and persons with disabilities, to at least national minimum standards, including access to social protection systems.

ESS 2: applies if the Project's screening process reveals that the Project's land acquisition activities would involve Involuntary Resettlement (including Involuntary Resettlement of the recent past or foreseeable future that is directly linked to the Project). Involuntary Resettlement covers physical displacement (relocation, loss of residential land or loss of shelter) and economic displacement (loss of land or access to land and natural resources; loss of assets or access to assets, income sources or means of livelihood) as a result of: (a) involuntary acquisition of land; or (b) involuntary restrictions on land use or on access to legally designated parks and protected areas. It covers such displacement whether these losses and involuntary restrictions are full or partial, permanent or temporary.

AIIB requires the Client to ensure that displaced person without title to land or any recognizable legal rights to land, are eligible for, and receive, resettlement assistance and compensation for loss of non-land assets,

in accordance with cut-off dates established in the resettlement plan, and that they are included in the resettlement consultation process.

Client conducts Social Impact Assessment and prepare resettlement plan (RP) or resettlement planning framework (RPF) where land acquisition results to involuntary resettlement or physical displacement and economic displacement.

Meaningful Consultation: Carry out meaningful consultations with persons to be displaced by the Project, host communities and nongovernmental organizations, and facilitate their informed participation in the consultations. Consult with all persons to be displaced on their rights within the resettlement process, entitlements and resettlement options, and further participation process. Ensure their involvement in planning, implementation, monitoring and evaluation of the resettlement plan. Pay particular attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, Indigenous Peoples and those without legal title to land, and ensure their participation in consultations.

Disclose the draft resettlement plan, including documentation of the consultation process, in the Project area, in a timely manner, in an accessible place, and in a form and language(s) understandable to persons displaced by the Project and other stakeholders. Disclose the final resettlement plan, and any updates to affected persons and other stakeholders in the same manner.

Grievance Mechanism: Establish a suitable grievance redress mechanism to receive and facilitate resolution of the concerns of persons displaced by the Project and inform them of its availability. ESS2 is applicable.

ESS 3: Indigenous Peoples

ESS3 is applicable if Indigenous Peoples are present in, or have a collective attachment to the proposed area of the Project, and are likely to be affected by the Project.

In the context of India, Indigenous Peoples may be referred to "Scheduled Tribes". As per Census of India, 2011 there is no Scheduled Tribe population in Haryana State.

Project-affected People's Mechanism Policy of the AIIB

AIIB's Project-affected People's Mechanism (PPM) has been established by the Bank to provide an opportunity for the independent and impartial review of submissions from PAP who believe they have been or are likely to be adversely affected by the Bank's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through the Project-level GRMs or the processes of the Bank's Management. This is applicable. PPM is available at:

<https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>.

Besides, the Bank allows access to any information in its possession that is not on a list of exceptions. Documents such as ESIA, RPF, and Resettlement Action Plan, etc. shall be disclosed by both the Borrower/Client and the Bank.

Commentary on Legal Framework & AIIB's Requirements

HORC Project was notified as Special Railways Project through GOI gazette notification No. 499 dated 04.02.2020. Sub-Divisional Officers of Palwal, Nuh, Tauru, Gurugram, Pataudi, Sohna & Bahadurgarh and District Revenue Officer of Sonipat were nominated as Competent Authority for Land Acquisition (CALA) through GOI gazette notification No. 947 dated 13.03.2020.

Determination of Compensation for Land Losers in Special Railways Project shall be finalized by CALA as per the “Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013”. The CALA shall make an award taking into consideration the provisions of this Act within a period of one year from the date of the publication of the 20E, otherwise Acquisition process will lapse. It is beyond the Competent Authority or the Collector to make an Award which is not in consonance with provision of State/Central Government. As the provisions of the RFCTLARR Act, 2013 are broadly aligned with the AIIB Policy, the legal framework which will be followed for HORC project for deriving compensation levels for affected families is in agreement with AIIB’s requirements.

Table 3.6: Applicable Policy and Standard of AIIB

Applicable Policy and Standard	Description	Applicability for the project
Environmental and Social Policy (ESP)	ESP sets forth mandatory environmental and social requirements for each Project and it is comprised of Environmental and Social Standard (ESS). It defines the key requirement as Screening and Categorization, Environmental and Social Due Diligence, Environmental and Social Assessment and ESMP	Applicable. The project will have limited number of potentially adverse environmental and social impacts; the impacts are not unprecedented; few of them are irreversible or cumulative; they are limited to the Project area; and can be successfully managed using good practice in an operational setting. ESIA study is required to examine the Project’s potentially negative and positive environmental impacts and recommends any measures needed to avoid, minimize, mitigate, or compensate for adverse impacts and improve environmental performance of the Project. The project fall in Category A.
ESS 1: Environmental and Social Assessment and Management	It defines the framework for the ESIA study and formulation of ESMP to avoid, minimize, mitigate and compensate negative impact and enhance positive impact.	Applicable. Project belongs to Category A and ESIA study is conducted and ESMP has been formulated as per the ESS 1.
ESS 2: Involuntary Resettlement	It provide the framework for the R&R study and formulation of RAP to ensure the standard of living of affected families and person will not be deteriorated	Applicable. Project will involve involuntary resettlement. A Social Impact Assessment (SIA), R&R study is carried out and RAP is formulated as per ESS 2.
ESS 3: Indigenous Peoples	It provide framework for the formulation of Indigenous Peoples Plan to respect and protect the Indigenous people right and welfare once affected from the project.	Not applicable. There is no STs population in the project influence area and project affected districts.
Environmental and Social Exclusion List	Defines and enlist the activities and project not to be funded by AIIB.	Project is not belongs to environmental and social exclusion list.
AIIB’s Project-affected People’s Mechanism	This mechanism provides an opportunity for an independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by AIIB’s failure to implement the ESP in situations when their concerns cannot be addressed satisfactorily through Project-level GRMs or AIIB Management processes.	This mechanism will help address grievances and to resolve complains raised from peoples.

Comparison between Legal Framework & AIIB Requirements

A comparison between laws governing land acquisition and AIIB policy and gap filling measures has been summarized below in **Table 3.7**.

Table 3.7: Comparison between AIIB Policy, Laws Governing Land Acquisition, and HRIDC RPF

Sl. No.	Items	AIIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
1	Existence of Policy Framework	AIIB prescribes elaborate Social Policy and Standards for Social Assessment and Management, Involuntary Resettlement and Indigenous Peoples	<p>The Govt. of India has passed RTFCTLARR Act, 2013 prescribing procedures, institutional arrangements, eligibility and entitlement framework and Government's obligations in acquisition of private land and R&R of affected people in a fair and transparent manner. The Act also makes special provisions related to consent and entitlements for Scheduled Castes and Schedules Tribes.</p> <p>The provisions contained in the First Schedule (compensation for land owners), Second Schedule (R&R entitlements), and Third Schedule (Provision of infrastructural facilities at resettlement site) are applicable to the Railways Act, 1989.</p>	<p>HRIDC has formulated the RPF for HORC project in accordance with the applicable National & State legal framework and AIIB's Environmental and Social Policy including Environmental and Social Exclusion List. The draft RPF will be discussed with AIIB and after obtaining concurrence from AIIB, the policy will be approved by HRIDC & HORC Boards for disclosure.</p> <p>The RPF broadly covers the following: (i) Applicable Legal and Regulatory Framework and Policies, (ii) Comparison between Legal Framework and AIIB Policy, (iii) Eligibility & Entitlements (compensation and R&R assistance) for all categories of Project Affected Persons [title holders & non-titleholders (persons occupying public or otherwise property without authority – encroachers, squatters)], (iv) preparation and implementation of RP, (v) Grievance Redress Mechanism, (vi) Meaningful consultations of affected people and other stakeholders, (vii) Monitoring & Evaluation, (viii) Disclosure, and (ix) Budget.</p>	The ESIA consultant engaged by HRIDC shall formulate the RP in collaboration with HRIDC and in meaningful consultations with affected people aligned with the requirements of AIIB's ESP subject to the provisions of laws governing land acquisition for HORC project. The RP will be based on the principles outlined in the RPF.
2	Project Screening and Categorization	Screening of proposed project using potential social risks and impacts to determine the nature and level of required social review, type of information disclosure and	There is no provision for conducting screening of the proposed project and categorization for further study.	Social screening has been conducted by a consultant at the concept stage while assessing feasibility of the project. Further, policies of funding agencies are also to be considered.	

¹ In accordance with Railways Act, 1989 & RTFCTLARR Act, 2013, Railways Circular No. E(NG)II/2010/RC-5/1 dated 11.11.2019, Railway Board Letter No. 2009/INFRA/3/1/10 Pt 2 dated 23.05.2015 and Gazette Notification No. S.O.-3/C.A. 30/2013/S. 30/2018 dated 23rd January 2018, Revenue and Disaster Management Department, Haryana

Sl. No.	Items	AIIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
		stakeholder engagement. Projects categorized as A, B, C and FI based on potential social risks and impacts,		According to the AIIB's Policy, the HORC Project is classified as 'Category A' as advised by AIIB Consultant.	
3	Assessment of Alternatives	Assessment of alternatives under Environment and Social Standard 1: Social Assessment and Management. Examination to avoid or minimize social impacts.	The SIA is expected {Clauses 4 (4) & 8 (2)} to ascertain that land to be acquired is absolute bare minimum and Govt. to ensure minimum displacement of people and minimum adverse impact on affected individuals.	The alignment for the HORC was already earmarked and approved in the Master Plan for National Capital Region. Therefore, scope for assessment of alternatives was not feasible. However, the RPF shall incorporate the objectives of minimization of involuntary resettlement by exploring viable alternative project designs.	The ESIA Report includes justification for selection of final alignment
4	Conduct Social Assessment	Client to conduct social impact assessment relating to the risks and impacts, and design appropriate measures to avoid, minimize, mitigate, offset or compensate for them. Determine the required scope of Involuntary Resettlement planning, through a survey of land and assets, a full census of persons to be displaced, and an evaluation of socioeconomic conditions specifically related to Involuntary	It is obligatory for the Government if it intends to acquire land for a public purpose to carry out a SIA study in consultation with concerned local Govt., at village level or ward level in the affected area {Clause 4 (1)}, which also involves public hearing, publication and appraisal.	It is mandated that social impact assessment and preparation of SIA will be undertaken for the project. The SIA to include a survey of land assets, a full census of persons to be displaced, and a socioeconomic survey to allow evaluation of socioeconomic conditions related to involuntary resettlement.	The ESIA consultant shall conduct surveys and collect information as per the scope of work issued by HRIDC. The SIA report shall be prepared based on the census and survey data, consultations and other information as available. The report to assess the extent of physical and economic displacement impacts in terms of persons and properties, measures adopted to avoid or minimize the impacts, risks associated with the project, and the vulnerability of PAPs etc. The report will be prepared keeping in view the social requirements under RFCTLARR Act 2013 and AIIB's ESP ESS2

Sl. No.	Items	AIIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
		<p>Resettlement risks and impacts. This establishes baseline information on assets, productive resources and status of livelihoods. Include consideration of customary rights, collective or communal forms of land tenure. Take gender into account in conducting the above.</p>			<p>on Involuntary Resettlement.</p>
5	Preparation of R&R Plan	<p>Client to prepare RAP consisting of measures to manage and mitigate adverse impacts in effective and timely manner and also describing the means (budget, schedule and institutional arrangements) for meeting the requirements and monitoring of the RAP.</p> <p>Prepare a Resettlement Plan comprising entitlements for different categories of</p>	<p>The Administrator for R&R is required to prepare Rehabilitation and Resettlement Scheme covering details of impacts and R&R entitlements for affected people (Clause 16).</p>	<p>HRIDC shall prepare a Resettlement Plan in accordance with the legal framework and requirements of RFCTLARR 2013 and AIIB ESP:</p> <p>Project description, methodology adopted for the study, cut-off date, socio-economic status of the project area, social impact assessment including, gender aspects, applicable legal framework, eligibility for entitlements and entitlements for each category of PAPs including vulnerable groups, institutional arrangement for RP implementation, GRM, and M&E, income and livelihood restoration strategy, implementation schedule and resettlement budget.</p>	<p>The ESIA consultant shall prepare a Resettlement Action Plan (RP) as per the national & state legal framework and ESP of AIIB to the extent of applicability. HRIDC to ensure that budget and resources are adequately provide to ensure successful implementation of the RP.</p> <p>The draft RAP to be prepared by HRIDC shall be shared with AIIB for review and will be disclosed on the website of HRIDC and AIIB in accordance with the Information Disclosure requirement of AIIB.</p>

Sl. No.	Items	AIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
		<p>affected persons, consultations, institutional arrangements, disclosure of draft and final RP, income restoration measures, M&E, schedule of implementation, resettlement budget etc.</p> <p>The resettlement plan should elaborate the displaced persons' entitlements, income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget and time-bound implementation schedule. Conduct meaningful consultations with affected persons on the resettlement plan and disclose the draft resettlement. The RP complements the broader coverage of social risks and impacts in the environmental and social assessment and provides specialized guidance to address the specific issues associated with Involuntary Resettlement, including land acquisition; changes</p>			

Sl. No.	Items	AIB Policy	Laws Governing land acquisition for HORC ¹	HRDC RPF	Remarks
		<p>in land use rights, including</p> <p>customary rights; physical and economic displacement; and potential design</p> <p>adjustments that may reduce resettlement requirements. In some cases, with the Bank's prior approval, resettlement actions may be part of an overall community</p> <p>development plan, where the Client takes special efforts to ensure people who are displaced receive appropriate benefits through such a plan. When displacement is</p> <p>only economic, prepare a livelihood restoration plan. Provide measures to be taken</p> <p>in case of disputes over compensation.</p>			
6	Compensation and benefits for displaced persons.	<p>Pay compensation and provide other resettlement entitlements before any physical or economic displacement under the Project as per the principle of replacement of cost.</p> <p>Livelihood Restoration. Improve, or at least restore, the</p>	<p>With the enactment of the RFCTLARR Act, 2013, the provisions of First, Second and Third Schedules of this Act have been made applicable to The Railways Act, 1989.</p> <p>First Schedule – deals with compensation for land owners</p> <p>Second Schedule – covers rehabilitation and</p>	<p>Compensation for landowners (First Schedule) and Rehabilitation and resettlement entitlements (Second Schedule), with provision of modalities for implementation of Serial No. 4 of Second Schedule as outlined in Railways Board Letter no. RBE. 193/2019 dated 11.11.2019, of this Act shall be applicable. Though the Provision of infrastructural facilities (Third Schedule) of this Act is applicable as per Railway Board letter no. dated 11.11.2019, it will not be relevant to HORC project due to non-</p>	<p>The draft RAP shall include the estimated resettlement budget covering compensation and rehabilitation and resettlement assistance.</p>

Sl. No.	Items	AIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
		<p>livelihoods of all persons displaced by the Project through: (i) where possible, land-based resettlement strategies when affected livelihoods are land-based or where land is collectively owned; or cash compensation at replacement value for land, including transitional costs, when the loss of land does not undermine livelihoods; (ii) prompt replacement of assets with assets of equal or higher value; (iii) prompt compensation at full replacement cost for assets that cannot be restored; and (iv) capacity building programs to support improved use of livelihood resources and enhance access to alternative sources of livelihood. Include transaction costs in determining compensation.</p> <p>Social Support. Where Involuntary</p> <p>Resettlement risks and impacts are highly</p>	<p>resettlement entitlements for all affected families (both land owners and the families whose livelihood is primarily dependent on the land acquired).</p> <p>Third Schedule – covers provision of infrastructure amenities at resettlement site.</p> <p>Thus, the land needed for the project will be notified and acquired as per the provisions of the Railways Act, 1989, but the compensation and R&R entitlements will be paid as per the First and Second Schedules of the RFCTLARR Act, 2013.</p>	<p>displacement of people at large scale and the rail corridor being a linear project.</p> <p>The entitlement matrix summarizing the various category of losses and corresponding entitlements and eligible entities has been prepared</p>	

Sl. No.	Items	AIIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
		<p>complex and sensitive, consider implementation of a social preparation phase to build the capacity of vulnerable groups to address resettlement issues, consisting of consultation with affected people and the host population before key compensation and resettlement decisions are made. The cost of social preparation is included in the resettlement budget.</p>			
7	Resettlement Assistance	<p>Provide persons displaced by the Project with needed assistance, including the following: (i) if there is relocation, security of tenure (with tenure rights that are as strong as the rights the displaced persons had to the land or assets from which they have been displaced) of relocation land (and assets, as applicable), proper housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their</p>	<p>The Second Schedule of the RFCTLARR Act, 2013 provides for a number of rehabilitation and resettlement entitlements for both land owners and the families whose livelihood is primarily dependent on the land acquired including provision of housing units in case of physical displacement or choice of one-time financial assistance for house construction in lieu of housing unit. The house allotted shall be in the name of the affected family.</p> <p>The third schedule of the RFCTLARR Act, 2013 provides for infrastructural amenities which include roads,</p>	<p>The entitlement matrix of HORC project has provision of rehabilitation and resettlement assistance as mentioned in Table 4. The Second Schedule of RFCTLARR Act, 2013 provides number of resettlement assistance to affected families (Titleholder and Non-Title Holder) is aligned with the requirement of AIIB ESF.</p>	<p>Cost for skill development training shall be borne by HRIDC.</p>

Sl. No.	Items	AIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
		<p>host communities and extension of Project benefits to host communities to facilitate the resettlement process;</p> <p>(ii) transitional support and development assistance, such as land development, credit facilities, training or employment opportunities; and (iii) civic infrastructure and community services, as required.</p>	<p>drainage, drinking water, electricity, bank, post office, access road, primary health facility, places of worship, cremation and burial places, and others.</p>		
8	Persons without Title or Legal Rights	<p>Ensure that persons without legal rights or un-recognizable legal rights for example, encroachers, squatters, non-titled lease occupiers and the like usually called non-titleholders are eligible and receive compensation and resettlement entitlements for loss of non-land assets as per the cut-off dates declared in the RP.</p>	<p>Railways follows RFCTLARR Act, 2013 and R&R entitlements/compensation shall be provided to persons without Title/legal rights as per the Act.</p>	<p>HRIDC recognize the existence of persons without title/legal rights and shall provide compensation as listed in Entitlement Matrix.</p>	<p>The ESIA consultant will also conduct surveys with affected persons without title and frame entitlements suitably. The compensation shall be provided to persons without Title/legal rights who have been staying prior to the Cut-off date</p>
9	Vulnerable Groups	<p>To improve the overall socioeconomic status of the vulnerable groups;</p> <p>The degree of impacts is determined by: (a) the scope of physical and economic displacement; and (b)</p>	<p>Second Schedule of the RFCTLARR Act, 2013 provides for an additional assistance of Rs. 50000/- for displaced SC & ST families from Scheduled Areas.</p> <p>Other vulnerable persons (weaker sections) such as</p>	<p>The vulnerable group shall be provided extra entitlementsas listed in Entitlement Matrix.</p>	<p>The ESIA consultant shall identify the vulnerable persons during surveys. The social impact assessment will present data and analyse them for</p>

Sl. No.	Items	AIIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
		<p>the vulnerability of the persons to be displaced by the Project;</p> <p>Where Involuntary Resettlement risks and impacts are highly complex and sensitive, consider implementation of a social preparation phase to build the capacity of vulnerable groups to address resettlement issues.</p>	<p>WHH, elderly persons, orphans, handicapped persons, destitute, BPL, marginal landowners, landless, etc are not covered by Second Schedule of the RFCTLARR Act, 2013.</p>		<p>vulnerable group separately.</p>
10	Information Disclosure	<p>Client to ensure that relevant information about social risks and impacts and RAP is made available in the project area in a timely and accessible manner, and in a form and language understandable to the PAPs, other stakeholders and general public.</p>	<p>The Act envisages disclosure of information in an appropriate manner at various stages during the entire process of LA & RR. The approved Rehabilitation and Resettlement Scheme is required to be made available in the local language to the local Govt. and in the offices of the District Collector, the Sub-Divisional Magistrate and the Tehsil, and is also required to be published in the affected areas and uploaded on the website of the Government (Clause 18).</p>	<p>The RPF comprise Disclosure mechanism of project documents. Draft RAP after review and endorsement by RPF, ESIA and RP shall be uploaded on the website of HRIDC and AIIB for public access. Copies of RP shall also be kept in the office of “Competent Authority” in all concerned districts for public viewing. Executive summary of Final RP shall be translated in Hindi. A copy of the Hindi version of Executive Summary of RP shall be distributed to Village Panchayats, Tehsil Offices and District HQ. In addition, copy of final RP and Hindi version of the Executive Summary of RP shall be available in the Project offices and site offices of the Project.</p>	<p>The ESIA consultant will discuss with HRIDC on this topic in view of AIIB’s policy and formulate the mechanism for information disclosure.</p>

Sl. No.	Items	AIIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
11	Consultation with stakeholders	<p>Client to engage in</p> <p>Carry out meaningful consultations with persons to be displaced by the Project, host communities and nongovernmental organizations, and facilitate their informed participation in the consultations. Consult with all persons to be displaced on their rights within the resettlement process, entitlements and resettlement options, and further participation process. Ensure their involvement in implementation, monitoring and evaluation of the resettlement plan. Pay particular attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, Indigenous Peoples and those without legal title to land, and ensure their participation in consultations.</p>	<p>The Act requires public hearing and publication of SIA study (Clause 5&6), publication of preliminary notification and hearing of objections (Clause 11&15) and publication of R&R Scheme (Clause 18).</p>	<p>The RPF formulated by HRIDC comprise engagement approaches that ensures the conduct of meaningful consultations with project affected people and other stakeholders during RP preparation and implementation, taking into consideration the current COVID19 situation. HRIDC to prepare a consultation plan. Consultations with PAPs, local community, Gram Panchayats, Key Informants, women, and other stakeholders shall be conducted as early as possible. Consultations can also be done during Census and socio-economic surveys or separately before or after the surveys as suitable depending upon the COVID-19 assessment. The concerns, issues, and suggestions of the stakeholders will be shared with the design/technical team for integration of their concerns and suggestions wherever feasible within the technical and financial limitations. RP preparation shall be undertaken with active participation of PAPs and Gram Panchayats. Draft RP shall be shared with the PAPs, NGOs, and other stakeholders and general public in the area through community meetings and other appropriate methods.</p> <p>All consultations and dialogues with PAPs and other Stakeholders should be adequately and properly documented. The documentations will be included as part of the SIA and RP</p>	<p>The ESIA consultant shall conduct meaningful consultations by organizing community meetings, focus group discussions (FGDs), workshop, and other means. Technical and E&S personnel of HRIDC and General Consultant should actively participate in the stakeholders consultations as much as possible for better appreciation of their concerns and consideration.</p> <p>HRIDC to prepare an interim Consultation Plan/Stakeholder Engagement Plan for the land acquisition that they plan to do. Consultations and engagements with PAPs and other stakeholders to be documented adequately.</p> <p>Share with AIIB schedule of consultations and AIIB Specialists and/or their ES consultants may attend (physically or virtually) in selected consultation activities.</p> <p>Carry out meaningful consultations with persons to be displaced by the Project, host communities and nongovernmental</p>

Sl. No.	Items	AIB Policy	Laws Governing land acquisition for HORC ¹	HRIDC RPF	Remarks
					<p>organizations, and facilitate their informed participation in the consultations. Ensure that consultation pay attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and those without legal title to land, and ensure their participation in consultations.</p>
12	Grievance Redress Mechanism	Client to establish a suitable grievance mechanism to receive and facilitate resolution of the concerns or complaints of people adversely affected by social impacts of project and inform PAPs of availability of mechanism.	The Act envisages establishment of Land Acquisition Rehabilitation and Resettlement Authority in each State by the concerned State Government to hear disputes arising out of projects where land acquisition has been initiated by the State Government or its agencies (Chapter VIII).	<p>The RPF suggests a GRM which includes two tier GRC-one at project level and other at Head Quarter level for ensuring timely resolution of grievances related to compensation and rehabilitation and resettlement or public grievances and complaints.</p> <p>Proper records shall be maintained at site and Project level for compilation and analysis of grievances, complaints, and ensuring follow up on all grievances.</p>	The ESIA consultant shall guide the HRIDC in designing the GRM procedures and constitution of committees at field and Project levels in consultation with relevant departments.
13	Monitoring and Reporting	Client to implement project in compliance with RAP and to furnish AIB with periodic monitoring reports on Client's performance under the project.	The Act provides for National Monitoring Committee for rehabilitation and resettlement and reporting requirements (Chapter VII).	The RPF formulated by HRIDC provides Internal & External Monitoring Mechanism for RAP implementation as per AIB Policy.	The monitoring arrangements (internal as well external) and reporting system shall be formulated by ESIA consultant based on discussion with HRIDC.

3.8 INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

Institutional Framework is a law or other formal provision that assign primary responsibility as well as the authority to an agency for the collection, processing, and dissemination of the statistics.

3.8.1 At India Level

3.8.1.1 Ministry of Environment, Forest and Climate Change

The Ministry of Environment, Forest and Climate Change (MoEF&CC) is the nodal agency for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programmes.

The primary concerns of the Ministry are implementation of policies and programmes relating to conservation of the country's natural resources including its lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. While implementing these policies and programmes, the Ministry is guided by the principle of sustainable development and enhancement of human well-being.

The broad objectives of the Ministry are:

- Conservation and survey of flora, fauna, forests and wildlife
- Prevention and control of pollution
- Afforestation and regeneration of degraded areas
- Protection of the environment and
- Ensuring the welfare of animals

Subjects under Ministry of Environment and Forests

- Environment and Ecology, including environment in coastal waters, in mangroves and coral reefs but excluding marine environment on the high seas.
- Environment Research and Development, education, training, information and awareness
- Environmental Health
- Environmental Impact Assessment
- Forest Development Agency and Joint Forest Management Programme for conservation, management and afforestation
- Survey and Exploration of Natural Resources particularly of Forest, Flora, Fauna, Ecosystems etc
- Bio-diversity Conservation including that of lakes and Wetlands
- Conservation, development, management and abatement of pollution of rivers, which shall include National River Conservation Directorate
- Wildlife conservation, preservation, protection planning, research, education, training and awareness
- International co-operation on Issues concerning Environment, Forestry and Wildlife
- Botanical Survey of India and Botanical Gardens

- Zoological Survey of India
- National Museum of Natural History
- Biosphere Reserve Programme
- National Forest Policy and Forestry Development in the country, including Social Forestry
- Forest Survey of India

3.8.1.2 Central Pollution Control Board (CPCB)

The Central Pollution Control Board is a statutory organization under the Water (Prevention and Control of Pollution) Act, 1974 with the powers and functions under the Air (Prevention and Control of Pollution) Act, 1981.

3.8.1.3 National Green Tribunal (NGT)

The National Green Tribunal is effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment. It is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues.

3.8.2 At State Level

3.8.2.2 State Pollution Control Board

State Pollution Control Board is a statutory organization entrusted to implement Environmental Laws and rules within the jurisdiction of the concerned state. The Board was also entrusted with the powers and functions under the Water (Prevention and Control of Pollution) Cess Act, 1977 along with other responsibilities under the Environmental Protection Act, 1986. The Water and Air Quality monitoring is an important part of the Environmental Management of concerned state pollution control board. It also provides background data needed for industrial siting and town planning. Board is regularly quality monitoring the major surface water bodies and ambient air quality in the concerned state.

CHAPTER – 4

BASELINE ENVIRONMENTAL AND SOCIAL DATA

4.1 GENERAL

This chapter describes the existing environmental and social status incorporating all environmental and social components in the study area. Baseline description, which involves collection of data on the existing status of the environment and social, helps in identification and assessment of impacts as a result of the proposed project. The objective of Environmental and Social Impact Assessment (ESIA) is to ascertain the baseline environmental and social conditions and then assess the impacts as a result of the proposed project activities during various phases of the project cycle. The baseline data has been detailed in following environmental component:

- Land Environment;
- Water Environment;
- Air Environment including Meteorology;
- Noise Environment & Vibration;
- Biological Environment;
- Socio-economic Environment.

The relevant environment information and data (Both Primary & Secondary) were collected during the month December 2020 to February 2021 in accordance with the guidelines for preparation of ESIA studies.

4.2 METHODOLOGY- ENVIRONMENTAL BASELINE MONITORING/DATA COLLECTION

4.2.1 Study Area

Primary baseline data is collected in the Right of Way (RoW) as well as is the area falling within 500 meters on the either side of the Right of Way (RoW), and secondary data is collected within 10 kms aerial distance. GIS Maps showing the project alignment, surrounding area covering 10 Km distance on either side of the proposed right of way is prepared. RoW of the project is not uniform all along the alignment. It is varied based on the formation width, stations & other design considerations.

4.2.2 Study Period

The baseline environmental quality represents the existing scenario of various environmental components in the study area. As part of Environmental and Social Impact Assessment (ESIA) study, baseline environmental monitoring was carried out for winter season covering the months of December 2020 to February 2021.

4.3 SECONDARY ENVIRONMENTAL DATA COLLECTION

Additional data was also collected from secondary sources like India Meteorological Department (IMD), Water Resource Department, Central Ground Water Board, Geological Survey of India, State Ground Water Department, State Pollution Control Board, Census of India, State Forest Department and Non - Governmental Agencies. The secondary environment data of the project districts are described in subsequent sections as follows:

- Physiography
- Geology
- Natural Resources
- Climate
- Seismicity
- Land-Use Pattern
- Water Resources
- Biodiversity including Forest, Wetland & Sanctuaries
- Religious and Cultural Heritage Sites
- Natural Habitats

4.3.1 Physiography

Physiography of project districts mainly consists of plains made up of alluvium of some parts of Yamuna River with pediments of Aravali. Almost all the project districts have similar characteristics except areas dominated by Aravali. Physio-graphically the five project districts (Palwal, Nuh, Gurugram, Jhajjar and Sonipat) are given in below Table.

S. No.	District	Physiographic Region
1	Palwal	Alluvial plains: Khadar and Banger
2	Nuh	Flat alluvial plains
3	Gurugram	Rolling plain and interspersed by extensions of Aravallis
4	Jhajjar	Indo-Gangetic alluvial plains
5	Sonipat	Khadar: upland plain and sandy region

Source: District Survey Report

4.3.2 Geology

Geology is defined as the study of rocks and minerals of the earth with respect to their origin, composition and mode of occurrence. The geology of project districts is predominated by the Quaternary alluvium and Aeolian sediments type covering nearly 95% of area. The rest 5% of area comprises Proterozoic and Tertiary rocks exposed in the southern and northeastern extremities of the state, respectively.

Sonipat district is almost entirely covered by alluvial deposits of clay, loam, silt and sand brought down by river Yamuna. High grade silica sand left behind by the change in course of the Yamuna River. The area of Jhajjar district forms a part of Dugan ethnic plain ranging from Pleistocene to recent in age Aeolian deposits. The sediments comprise of clay, sand and Kankar mixed in different proportions.

Large parts of Gurgaon and Nuh district are occupied (i) by scattered isolated strike ridges of old rocks, former Aravali mountain chain of Pre-Cambrian and (ii) alluvium, sand of recent to sub-recent origin. Palwal district are occupied by alluvial plains of recent to sub-recent age, which include older (Banger) and newer (Khadar) alluvial and kankar. The kankar occurs mainly in the northern part and is poor in calcareous matter.

4.3.3 Natural resources

a) Soil

The soils type and distributional pattern in project districts is complex, reflecting a variety of parent-material, the range and distribution of rainfall and temperature, variations in the intensity of irrigation and land-use and hydrological hazards. Soil constitutes the most precious natural resource of the project districts. A variety of soils are found in area due to the marked variation in the physiographic and climatic conditions. The major soil groups found in project area are sandy loam, clay loam, silty clay and old alluvial which are given in **Table 4.1**.

Table 4.1: Soil Type of Project Area

S. No.	District	Soil Type
1	Palwal	Sand to loamy sand, sandy loam to clay loam, sandy loam to loam (surface), clay loam/silty clay (sub-surface)
2	Nuh	Sandy loam to loam
3	Gurugram	Sand to loamy sand, sandy loam to clay loam / silty clay loam in alluvial plains, calcareous, loamy sand to loam in salt affected plains, silty loam to loam in low lands and calcareous, loamy sand to loam in hills.
4	Jhajjar	Old alluvial plains and Aravali plains.
5	Sonipat	Loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface
Overall soil type of project area		Sandy loam, clay loam, silty clay and old alluvial, sand to loam in hills, calcareous

Source: Haryana Agriculture Department

b) Minerals

The variegated geological set-up of project area has provided locales for the formation of a vast range of economic minerals. Various rocks and minerals are found in the project districts. Several of these minerals are exploited for industrial uses. Minor minerals are major sources of income as revenue is derived from the auctioning of these minerals. On the other hand, almost all the industrial rocks and remaining minerals are grouped under 'major minerals'. A number of major minerals, though in small quantities, are also found. The area possesses mainly brick earth, salt petre and quartzite. Excellent quality slate is found in Gurgaon district. Brick earth or ordinary clay suitable for manufacturing of bricks is available in plenty in almost every part of the project area. Practically inexhaustible deposits of quartzite are found in the Aravali ranges in the districts of Gurgram. Low-grade hematite and jasperoid hematite occur in Firozpur Jhirka area of Gurgram district.

Minor minerals include building stones, gravel, ordinary clay, ordinary sand, boulder, chalcedony pebble, kankar and limestone (used for lime burning) and brick earth. Among the minerals found in the area, important ones are dolomite, feldspar, kaolin and building stone materials. A map showing minerals locations in Haryana is given in **Figure 4.1**.

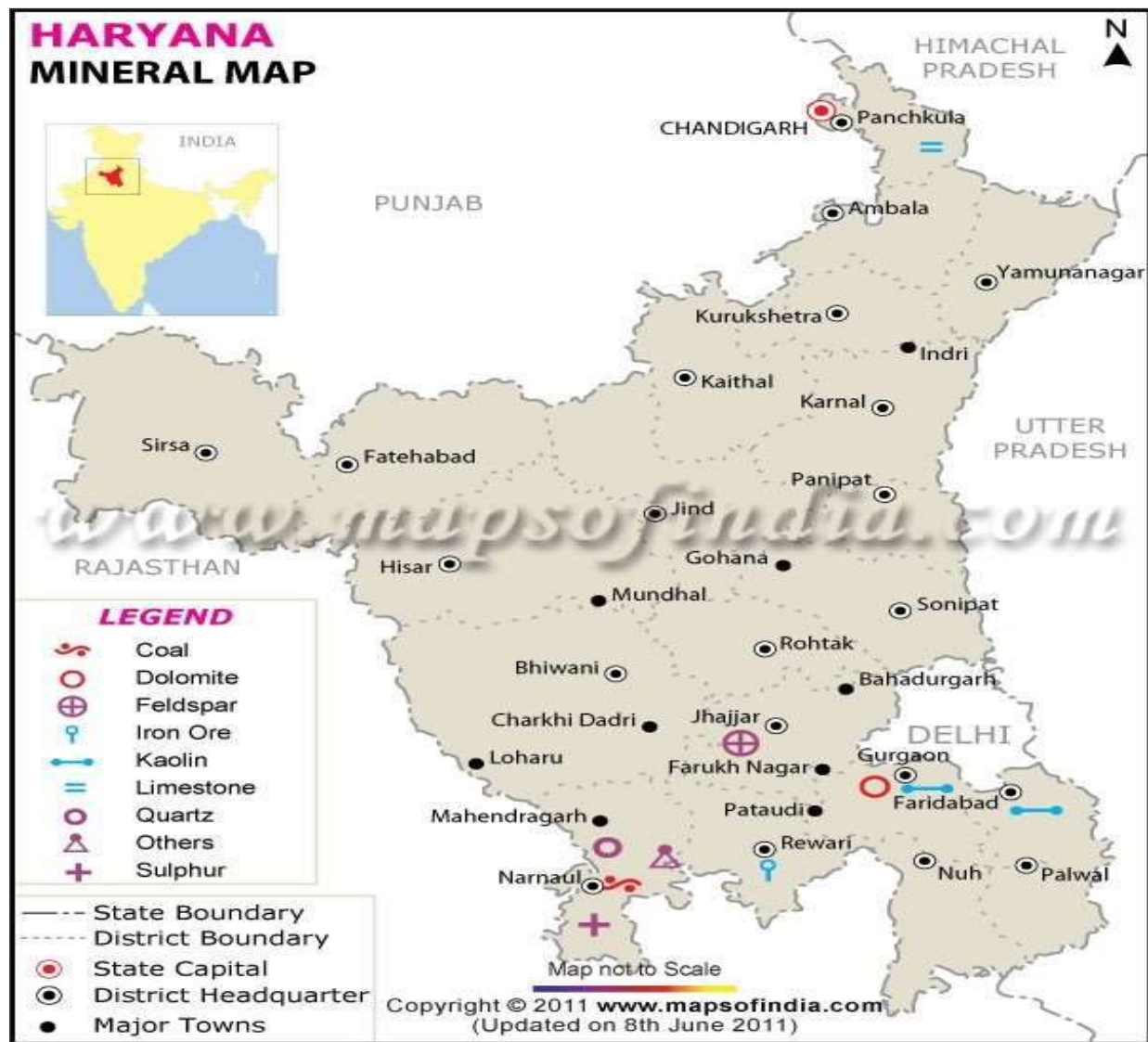


Figure 4.1: Minerals Map of Haryana (Source: Map of India)

4.3.4 Climate

Climatic conditions in these five districts ranges from dry sub-humid to arid, along a representative north-east south-west transact. This arises mainly due to its continental location and its distance from the mountains. On the whole, climate of Haryana can be classified as a subtropical continental monsoon type. It may be characterized as having seasonal rhythm, hot summers, cool winters, mostly dry except for two to three months (July to Sept.), meager and unreliable rainfall and great annual range of temperature. It is interesting to note that the whole Haryana has a vegetative period of 365 days. The change from hot to cold season enables Haryana to grow tropical and sub-tropical temperate crops. In all, three seasons can be recognized and they are hot weather season, cool winter season and a short rainy season.

The hottest months are May and June and the coldest December and January. During the months of May and June, average maximum temperature is 42.71 °C and in winter the minimum average temperature is 6.20 °C for five project districts. Temperature variations are high ranging from 40 °C (Nuh and Jhajjar) to

45 °C (Palwal, Nuh and Gurugram) during summer season. During winter the temperature goes down 7 °C (Palwal and Sonipat) to 4 °C (Nuh).

The average annual rainfall of these districts is 578.99 mm (1997 to 2001). About 74 % of annual rainfall is received during the monsoon season. The maximum rainfall was recorded from Sonipat (612.3mm) and minimum from Gurugram (56.1mm). The detail of Temperature and Rainfall status of Project districts is given in **Table 4.2**.

Table 4.2: Temperature and Rainfall Status of Project Districts (2019)

S. No.	District	Project Length (km)	Weight	Temp (Minimum in °C)	Temp (Maximum in °C)	Rainfall (in mm)
1	Palwal	7.04	0.057	7	45	568.0
2	Nuh	21.057	0.170	4	40	577.0
3	Gurugram	34.74	0.280	7	45	560.1
4	Jhajjar	35.835	0.289	6	40	577.0
5	Sonipat	25.438	0.205	7	45	612.3
Total/Average		124.11	1.000	6.20	42.71	578.99

Sources: District Survey Report

a) Humidity

The relative humidity is generally high during the period from June to September. August is the most humid month. Summer months form the driest part of the year when humidity is low particularly April is the least humid month.. In summer season humidity is around 25% while in monsoon when the rainfall occurs, the relative humidity is more than 88%. The average annual percentage of humidity is: 49.0%.

b) Wind Speed/Direction

The wind speeds are light to moderate with some strengthening during the southwest monsoon. The wind speeds are generally high during the period from April to August. The wind speed and directions for the 5 project districts for year 2020 are given in **Figures 4.2 to Figure 4.6**. Dominant wind direction in Sonipat and Jhajjar is West and North West while the same is South West for remaining three districts i.e. Palwal, Nuh and Gurugram.

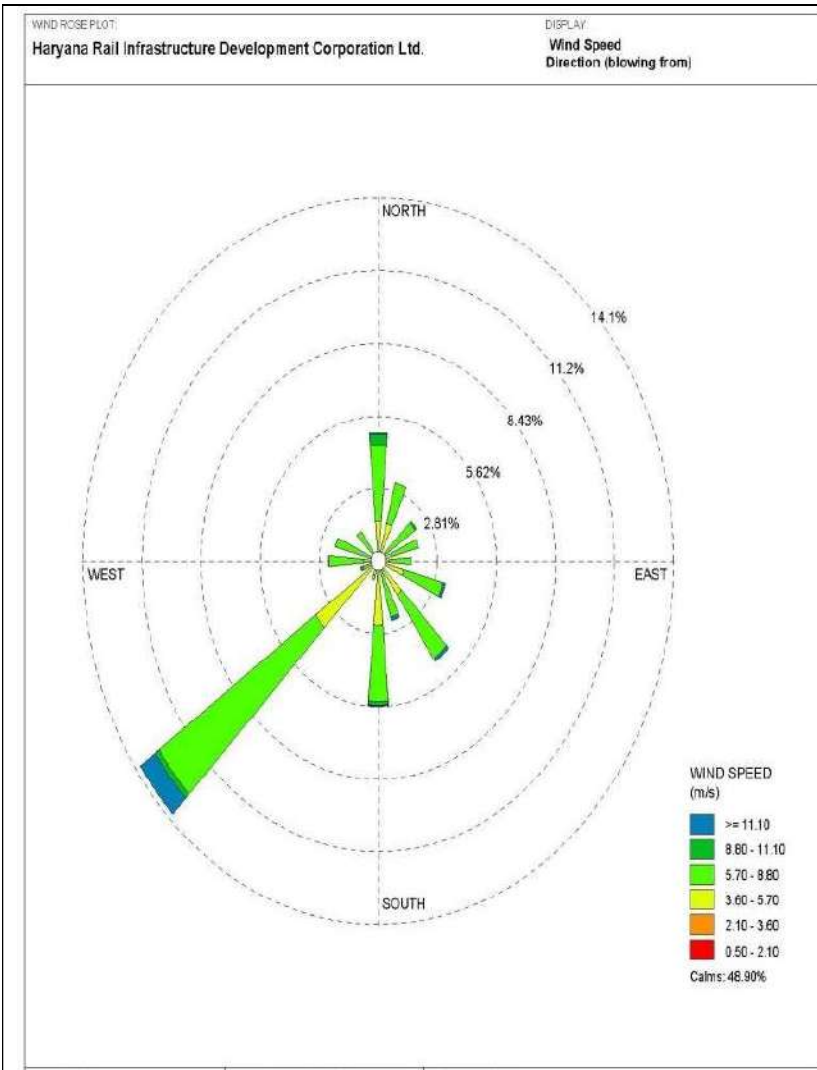


Figure 4.2: Wind Speed & Direction of Gurugram

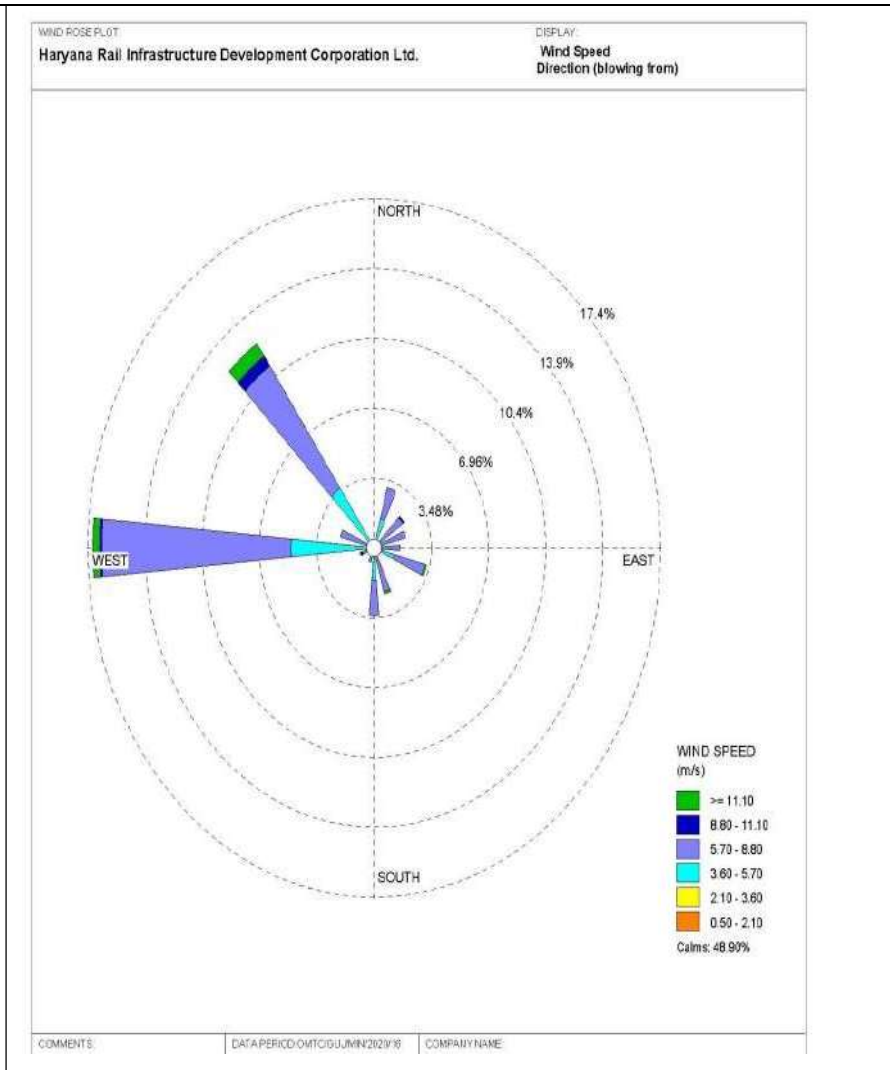


Figure 4.3: Wind Speed & Direction of Jhajjar

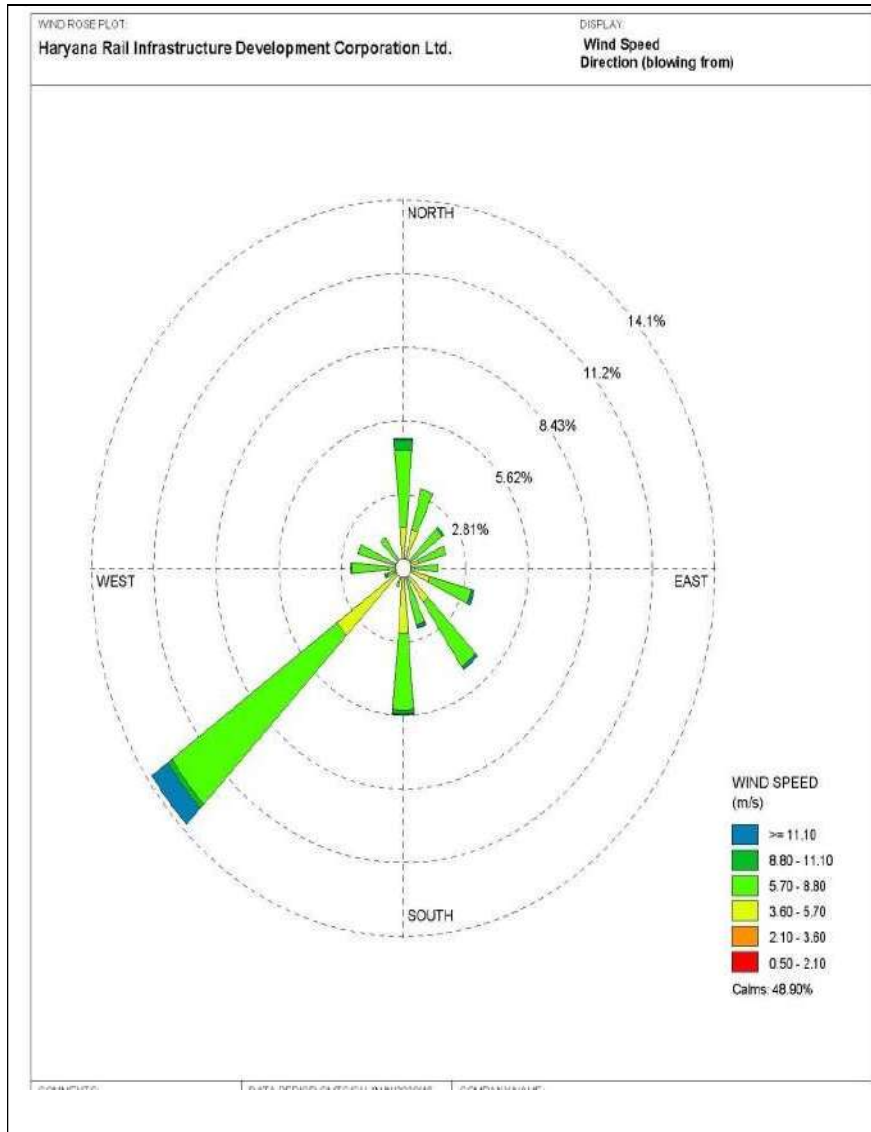


Figure 4.4: Wind Speed & Direction of Nuh

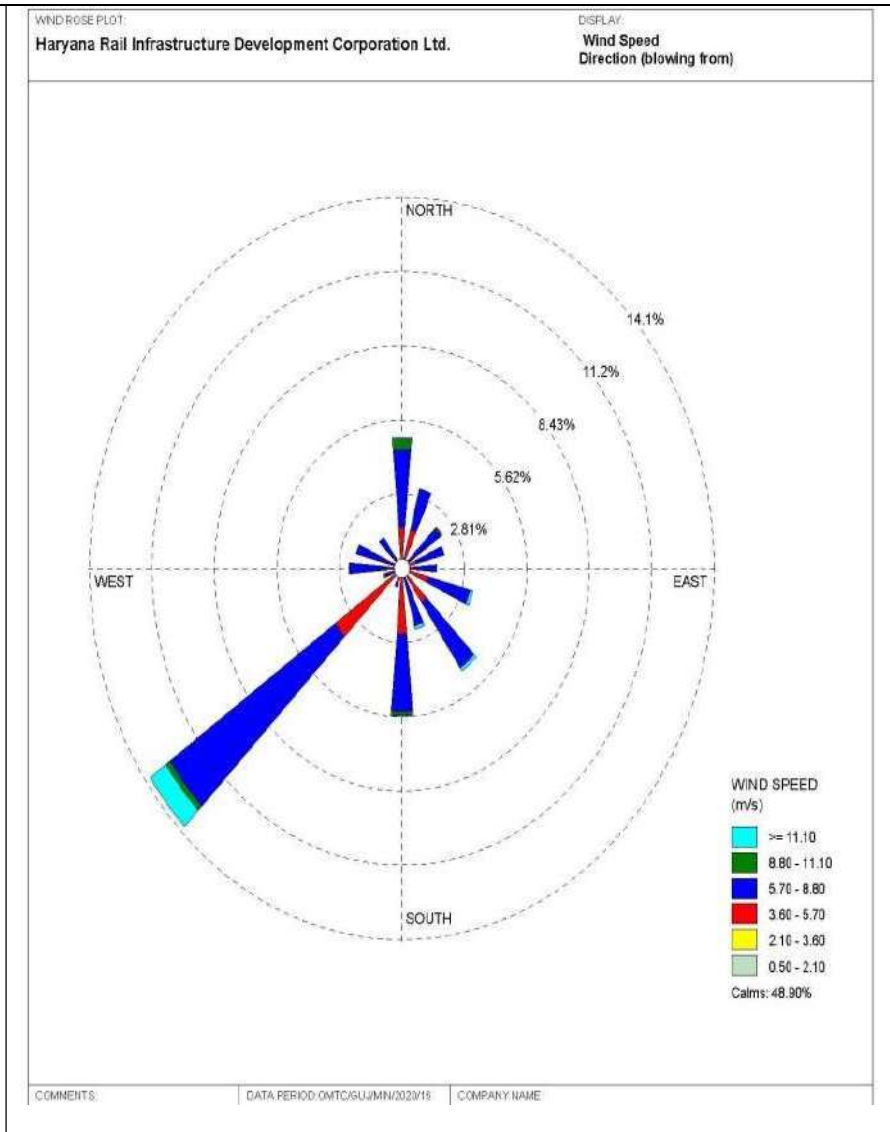


Figure 4.5: Wind Speed & Direction of Palwal

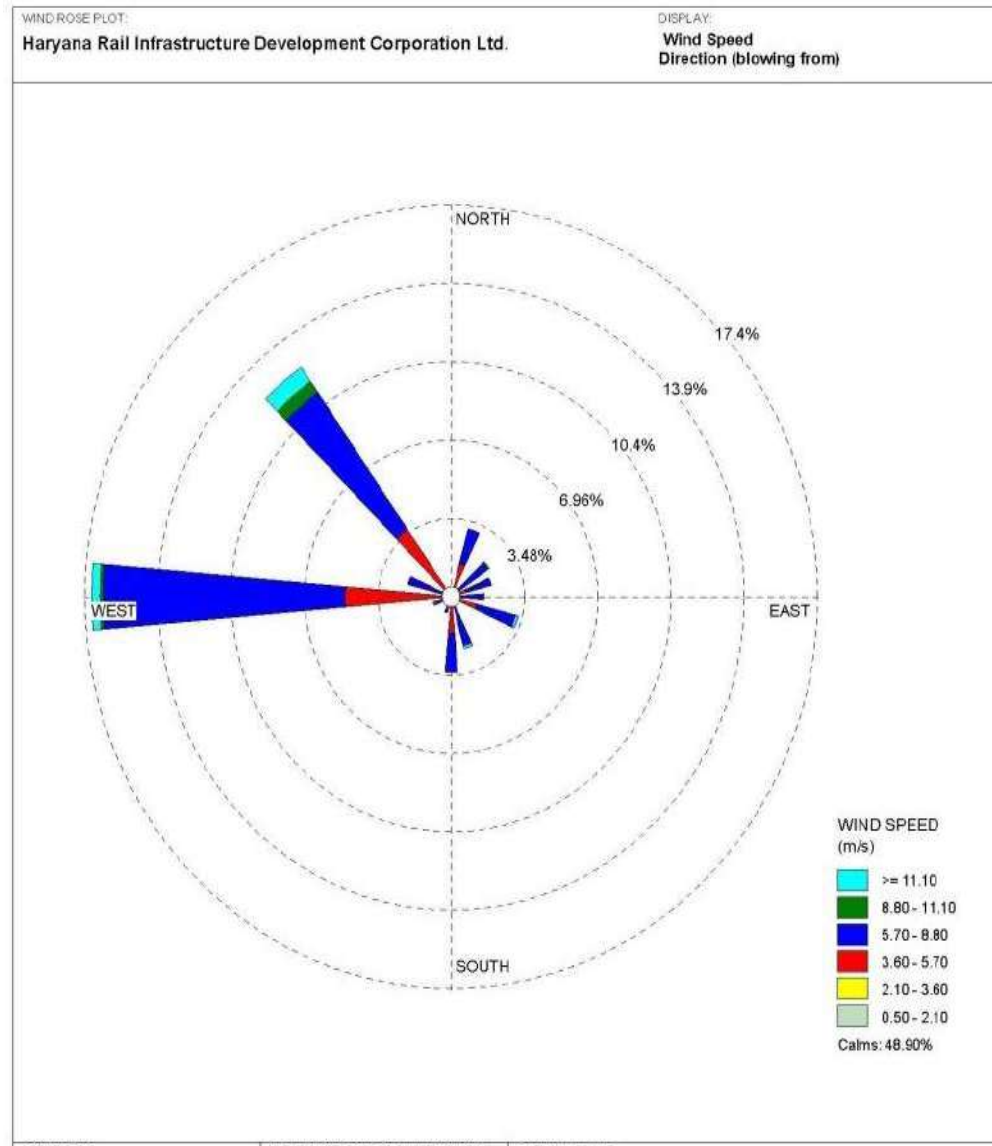


Figure 4.6: Wind Speed & Direction of Sonipat

4.3.5 Seismicity

Project districts and project alignment lie in Zone IV risk zone. This is classified as high damage risk zone (MSKVIII) in respect to earthquakes. Therefore, suitable seismic coefficients based on relevant Indian Standards shall be adopted in the design of structures (**Figure 4.7**).

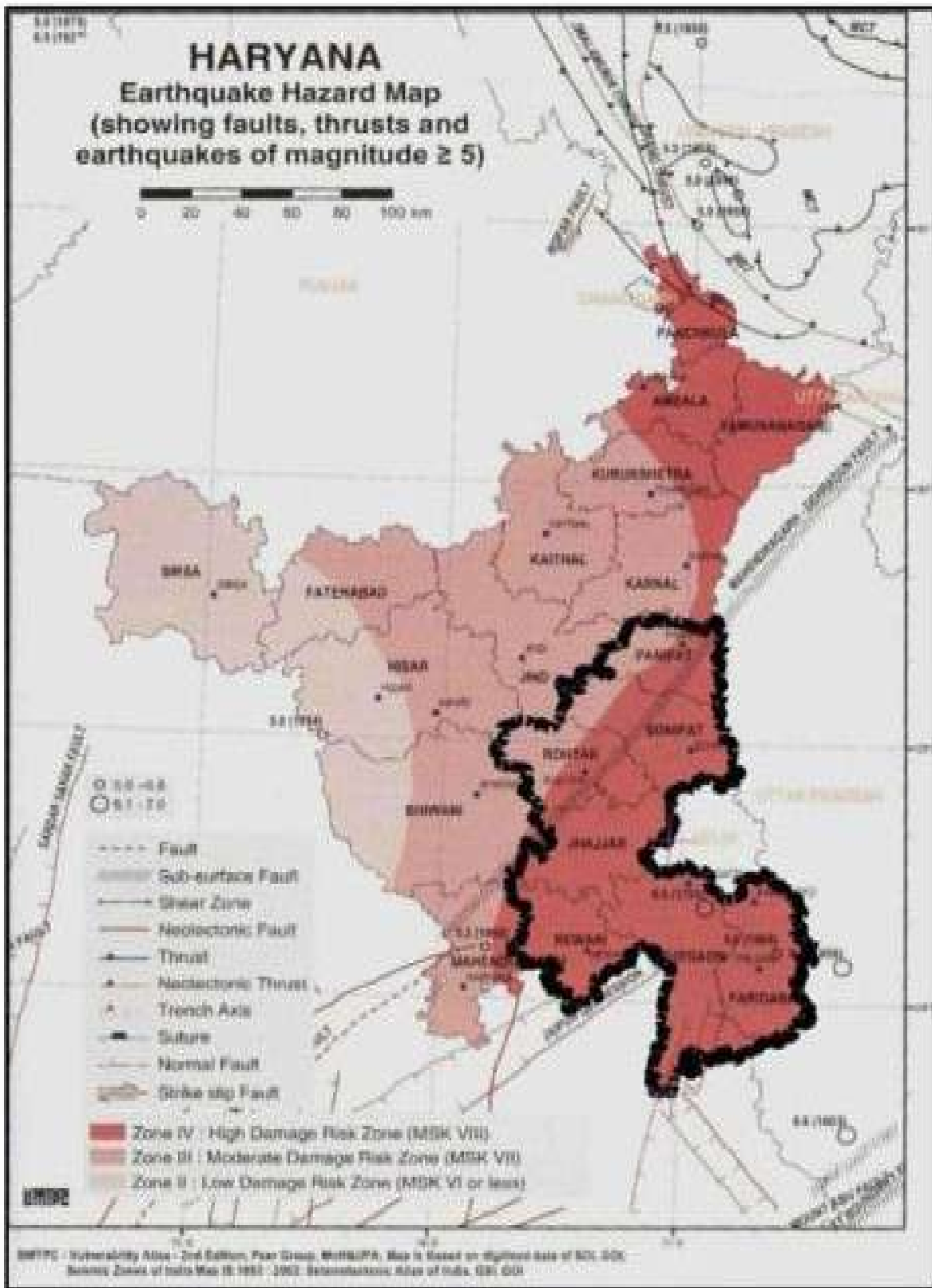


Figure 4.7: Earthquake Hazard Map of Haryana (Source: Haryana Disaster Management)

4.3.6 Land Use Pattern of Project District

Out of the total maximum area of **83.79 %** is agricultural area, **6.76%** area is build up area, **4.87%** area is Wasteland, **3.77%** area is forest land and remaining **0.5%** and **0.25%** area is under Water bodies and Others. The land use of the Project Districts is given in **Table 4.3**.

Table 4.3: Landuse Pattern of Project Districts (Ha)

S. No.	District	Built-up	Agriculture	Forest	Wasteland	Water Bodies	Others	Total
1	Palwal	7436	130056	2197	1344	1673	369	143075
2	Nuh	6938	119252	8841	13545	308	265	149150
3	Gurugram	19448	84595	8889	15866	210	62	129069
4	Jhajjar	9058	164520	3902	7004	875	1153	186513
5	Sonipat	12934	193099	7357	2441	1388	211	217430
Total		55814	691522	31186	40200	4454	2060	825237
Percentage		6.763	83.797	3.779	4.871	0.540	0.250	100.0

Source: Sub Regional Plan for Haryana Sub-Region of NCR-2021

4.3.7 Water Resources

Water environment consists of water resources such as streams, rivers, nallas, pond, canal and lakes. Water quality parameters of water resources available in the area have been studied to evaluate the suitability of water for drinking purposes and to anticipate impacts of the proposed projects.

a) Ground water

Ground water is an important resource for meeting the water requirements for irrigation, domestic and industrial uses. The ground water availability for irrigation, domestic & industrial requirement is maximum in Sonipat district and minimum in Nuh district (Central Ground Water Board, 2009). The details of Ground Water Resources of project districts are given in **Table 4.4** and Ground Water Resources Assessment data of 2017 is given in **Table 4.5**. Net annual ground water availability in project area is estimated to be 44769 mcm. And the existing gross ground water draft for all uses is found to be 46891 mcm. Thus, ground water development is already over 97% in the project districts. Therefore, the ground water should not be utilized for the construction purposes. And at all cost the ground water use in Gurugram, Nuh and Palwal should be restricted for construction purposes.

Table 4.4: Ground Water Resources of Project Districts, 2009 (in mcm)

Description	Name of the District				
	Sonipat	Jhajjar	Gurugram	Nuh	Palwal
	Unit (Ha-m)				
Net Annual Ground Water Availability	77426	42718	23,261	21623	44769
Existing Gross Ground Water Draft for irrigation	90622	40751	35,777	13280	45894
Existing Gross Ground Water Draft for domestic and industrial water supply	3913	192	18,150	1173	-

Description	Name of the District				
	Sonipat	Jhajjar	Gurugram	Nuh	Palwal
	Unit (Ha-m)				
Existing Gross Ground Water Draft for All uses	94535	40943	53,927	14453	46891
Provision for domestic, and industrial requirement supply to 2025	4168	230	18,150	1830	953
Net Ground Water Availability for future irrigation development	-17364	1737	-30,666	6513	2074
Stage of Ground Water Development (%)	122	96	232	67	12

(Abbreviation: Ha-m- hectare-meter)

Source:

- Central Ground Water Board, Chandigarh, 2009- For districts Sonipat, Jhajjar, Gurugram & Nuh.
- Central Ground Water Board, 2013- Only for Palwal District

Table 4.5: Ground Water Resources Assessment of Project Districts, 2017

S. No.	District	Assessment Unit Name	Categorization (OE/Critical/Semicritical /Safe)
1	Palwal	Palwal, Hodal, Hathin, Hassanpur	Over-exploited
2	Nuh	Punahana, Taoru	Over-exploited
		Nagina	Safe
		Nuh, Ferozepur Jhirka	Semi-critical
3	Gurugram	Gurgaon, Pataudi, Farrukh Nagar, Sohna	Over-exploited
4	Jhajjar	Jhajjar, Beri, Matannail, Salhawas, Bahadurgarh	Safe
5	Sonipat	Sonipat, Rai, Ganaur	Over-exploited
		Kathura, Kharkhoda, Gohana	Safe
		Mundlana	Semi-critical

Source: Central Ground Water Board (CGWB)

In the project districts, ground water occurs in alluvium as well as in hard rocks. Ground water at shallow depths occurs under unconfined conditions, whereas at deeper levels confined/conditions prevail. The district-wise depth of water (Pre-monsoon 2019) is presented in **Figure 4.8** and given in **Table 4.6** for 5 project districts (Palwal, Gurugram, Jhajjar, Nuh and Sonipat).

Table 4.6: District Wise Depth of Water (Pre-Monsoon 2019)

S. No.	District	No. of Well Monitored	Depth of water level (Mbgl)	
			Minimum	Maximum
1	Palwal	14	2.10	22.61
2	Nuh	07	0.48	7.21
3	Gurugram	10	9.04	60.20
4	Jhajjar	10	1.31	5.10
5	Sonipat	22	2.46	34.35

Source: Central Ground Water Board (CGWB)

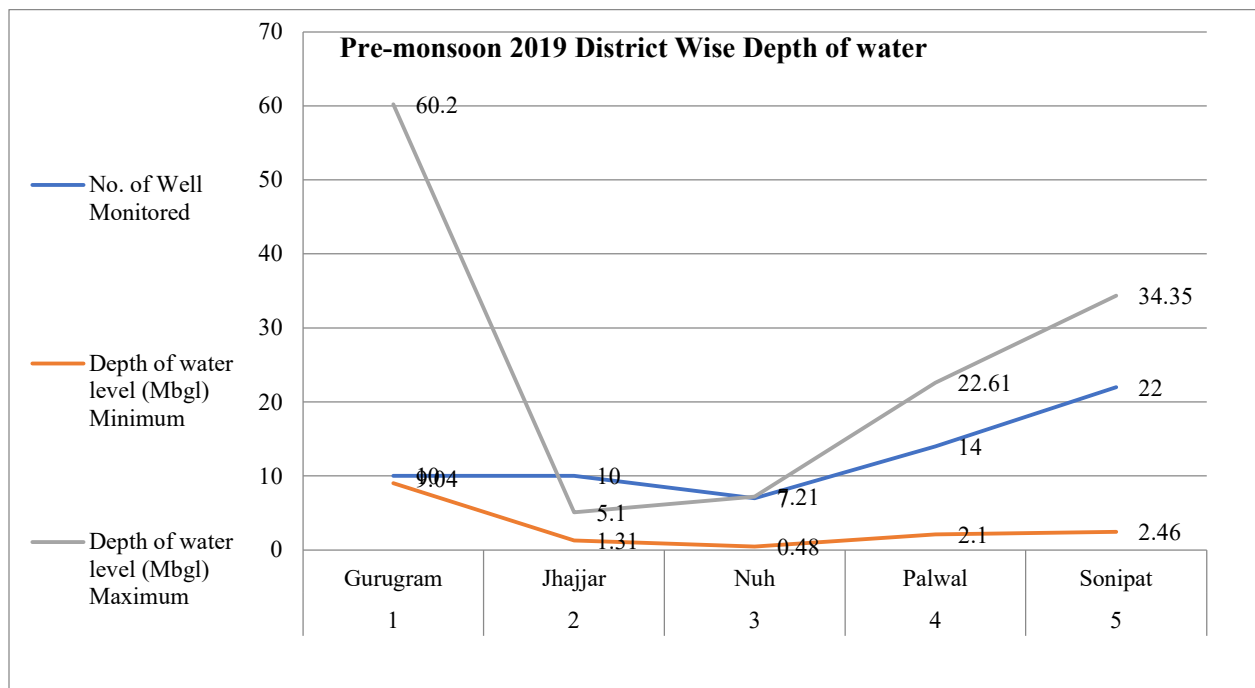


Figure 4.8: Water Depth of Five Districts of Proposed Project

It is evident from the above figure that in 2019 (data sourced from CGWB), the ground water depth is maximum in Gurugram districts whereas it is low in Jhajjar.

Saline ground water occurs mainly in some parts of Jhajjar, Nuh and Gurugram districts. This water is mostly unsuitable for drinking due to one or more constituents exceeding the maximum permissible limits in Jhajjar and Nuh. These districts have less than 30% ground waters having chemical parameters within the permissible limits. In the Gurugram district, 30-50% water samples are having potable quality as per BIS 2012 standards. This is aggravated due to extensive canal network adding surface water to saline ground water and non-exploitation of ground water due to its saline quality.

b) Water Bodies (River Systems, Canal, Wetlands)

Canals are the most popular and important source of irrigation in project districts due to easy supply and regular flow of water to the agriculture fields. In the Inland drainage basin, the drains excavated are made to outflow in canals through lift pumps. The canals network is dense in most of the project districts.

The project alignment districts are persistently covered by water bodies such as rivers, reservoirs, lakes, ponds, Yamuna, Yamuna Wetland Systems, Damdama Lake (Gurgram) Sohna Lake / Hot water Spring (Gurgram), Kotla Dhar Lake (Nuh) and all existing constructed and natural water bodies including village ponds. The proposed alignment does not pass any major water bodies except irrigation canals.

Irrigation systems in the project alignment districts have nine canals network which are crossing the alignment. Agra Canal plays the major part which intersects the alignment at three different places. The district Gurgaon fall under Agra canal commands. Najafgarh drain and Kasar drain also found which intersect the alignment. The water of these canals is used for irrigation purposes. The details of canals

crossing the alignment are given below in **Table 4.7** and shown in **Figure 4.9**. Details of major water bodies of project affected districts are given in **Table 4.8**.

Table 4.7: Location of Canals & Drain Crossing the Proposed HORC Alignment

S. No.	Name	Aerial Distance From Proposed Alignment	Chainage (m)	Geo Coordinates	
				Latitude (N)	Longitude (E)
1	Agra Canal	0 Km (Intersect)	-812	28°14'42.15"	77°15'35.26"
		0 Km (Intersect)	8000	28°13'45.56"	77°10'21.43"
		0 Km (Intersect)	23780	28°11'47.68"	77°2'52.60"
2	Najafgarh Drain	0 Km (Intersect)	69900	28°31'42.54"	76°49'49.63"
3	Kasar Drain	0 Km (Intersect)	83+100	28°38'45.56"	76°48'49.35"
4	C - 3	0 Km (Intersect)	93+400	28°43'50.14"	76°50'47.11"
5	C - 4	0 Km (Intersect)	94+270	28°44'24.68"	76°51'1.18"
6	C - 5	0 Km (Intersect)	95+050	28°44'42.66"	76°51'9.14"
7	C - 6	0 Km (Intersect)	96+450	28°45'30.92"	76°51'37.91"
8	C - 7	0 Km (Intersect)	102+900	28°48'25.11"	76°53'27.20"
9	C - 8	0 Km (Intersect)	118850	28°53'50.71"	77°0'49.78"
10	C - 9	0 Km (Intersect)	123450	28°54'44.62"	77°3'14.05"

Sources: Field Study

Table 4.8: Details of Major Water Bodies Present in the Project Districts

S. No.	District	Name of water Body	Area cover (in Ha)	Side from Alignment	Chainage (Km)	Aerial Distance from Alignment	Geo Coordinates	
							Latitude (N)	Longitude (E)
1	Gurugram	Sultanpur Lake	67.18	Right	Near to 58+000 to 60+000	3.40km	28°28'4.02"	76°53'29.92"
		Damdama Lake	20.23	Right	Straight From 11+000 to 12+000	8.0km	28°18'14.28"	77°7'41.59"
2	Jhajjar	Bhindawas	400	Left	Straight From 65+000 to 68+000	27.04km	28°31'54.76"	76°33'7.72"
		Khaparwas	49.5	Left	Straight From 70+000 to 71+000	29.10km	28°33'49.84"	76°31'36.61"

Sources: Field Study

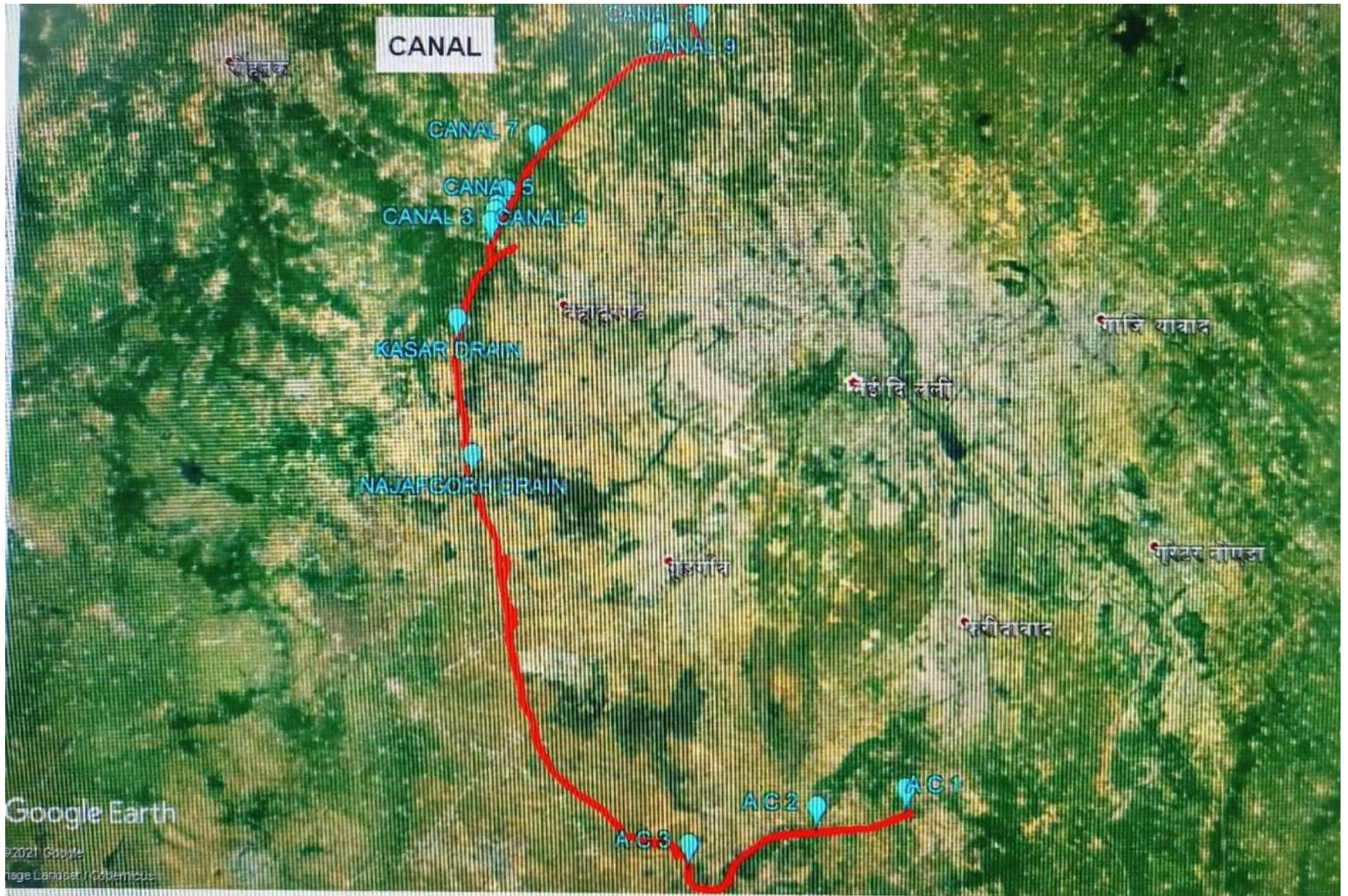


Figure 4.9: Location of Canal and Drain Crossing the Proposed HARC Alignment

4.3.8 Biodiversity

a) Forest and Forest Type

Project area is divided in two natural zones, the Shiwaliks & Aravali and Indo-Gangetic plain. Forests in the project area are mainly north-eastern forest zone of the Haryana. The Forest Cover in the Project State is 3.62% of the geographical area (ISFR 2019). In terms of forest canopy density classes, it has 28.00 sq km under Very Dense Forest (VDF), 450.90 sq km under Moderately Dense Forest (MDF) and 1,123.54 sq km under Open Forest (OF). The project state has reported extent of recorded forest area (RFA) 1,559 sq km which is 3.53% of its geographical area. The reserved, protected and un-classed forests are 15.97%, 74.28% and 9.75% of the recorded forest area in the state.

There are four type of forest type (Dry Siwalik Sal Forest 5B/C1a; Northern Dry Mixed Deciduous Forest 5B/C2; Dry Deciduous Scrub 5/DS1 and Siwalik Chir Pine forest 9/C1a) found in project state/area. Broadly these forest type are grouped under two type group (Group – 5 Tropical Dry Deciduous and Group – 9 Sub-Tropical Pine Forest) classified by Champion & Seth (1968). In project districts, the maximum forest cover is recorded in Gurugram district (116.18 sq. km) followed by Nuh (111.18 sq. km), Jhajjar (25.93 sq. km), Sonipat (20.97 sq. km) and Palwal (13.97 sq. km). The forest cover of project districts is given in **Table 4.9** and **Figure 4.10**. Also total areas of reserved and protected forest are given in **Table 4.10**.

Table 4.9: District- Wise Forest Cover (in sq km) in Project Area

S. No.	District	Geographical Area	Very Dense Forest	Mod. Dense Forest	Open Forest	Total
1	Palwal	1,359	0.00	1.97	12.00	13.97
2	Nuh	1,507	0.00	14.00	97.18	111.18
3	Gurugram	1,258	0.00	33.69	82.49	116.18
4	Jhajjar	1,834	0.00	0.00	25.93	25.93
5	Sonipat	2,122	0.00	3.00	17.97	20.97

Source: ISFR – 2019

Table 4.10: District- Wise Reserved Forest and Protected Forest Cover (in ha)

S. No.	District	Reserved Forest (in ha)	Protected Forest (in ha)
1	Palwal	139	1941
2	Nuh	16	1331
3	Gurugram	215	1588
4	Jhajjar	0	3826
5	Sonipat	0	7359

Source: CF (FCA) of PCCF Haryana 2011

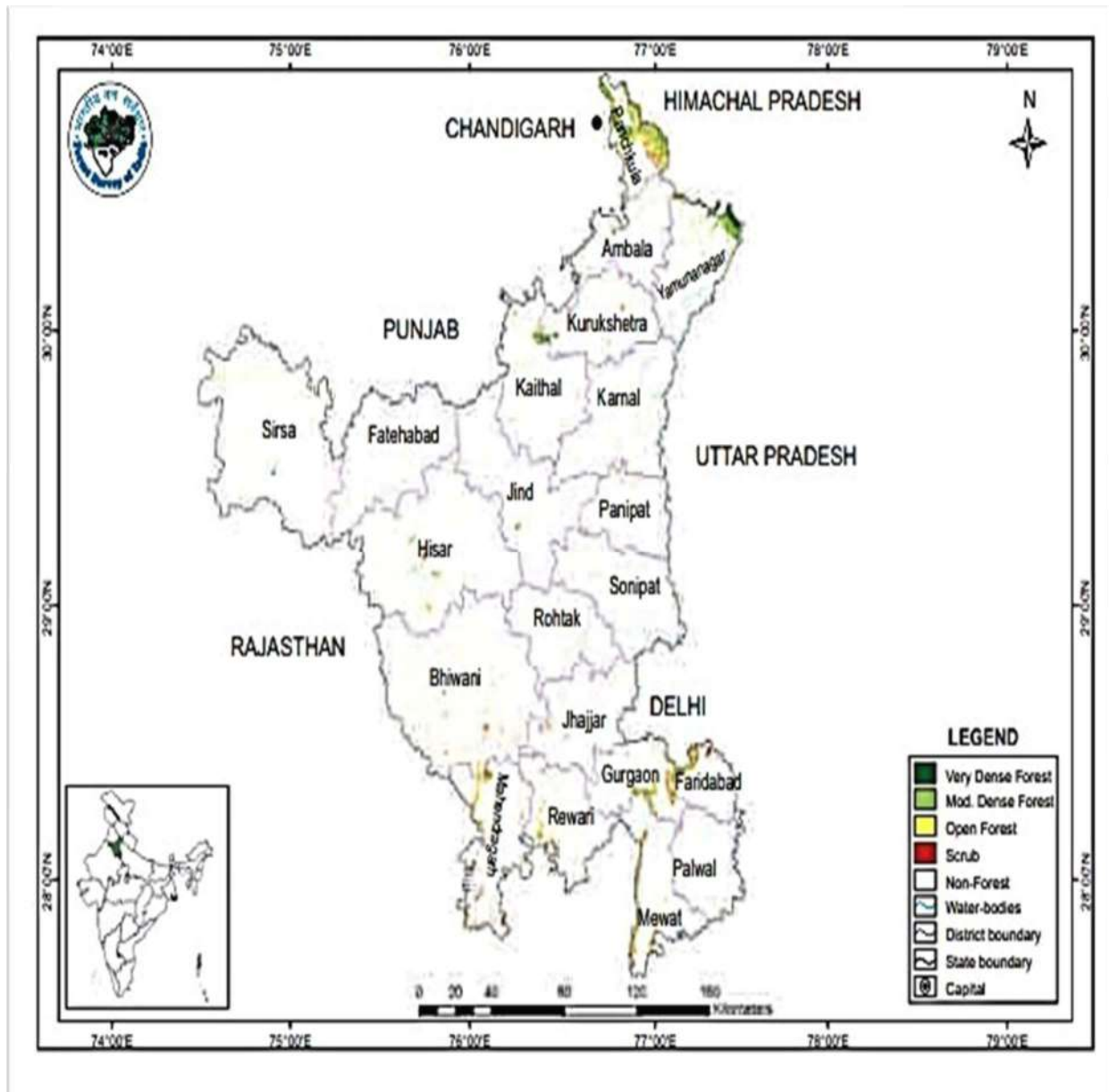


Figure 4.10: Forest Cover Map of Haryana (Source: ISFR, 2019)

Adjacent to the proposed HORC alignment there are three Reserved Forest covering a total area of 206.51 hectare and two Protected Forest covering a total area of 115.02 hectare as given below in **Table 4.11** and shown in **Figure 4.11**. Project alignment is not crossing these reserve forest and protected forest. About 21.4232 ha of forest area are likely to be affected by the project which falls under the category of protected forest (**Table 4.12**). In this forest area, railway, road and canal plantation are considered under protected forest. The compensatory afforestation and forestry clearance will be required for the affected forest area under the project alignment.

Table 4.11: Reserved and Protected Forest Closest to the Proposed Alignment

S. No.	Forest Category	Name	Direction	Distance From Proposed Railway Alignment (in Km)	Area (in Ha.)
1	Reserve	Bawana RF	E-Right	9.68	27.03
2	Reserve	Sir Bisanpur RF	W	3.95	144.42
3	Reserve	Rangala RF	W	5.8	35.06
4	Protected	Mamupur, Narela PF	E-Right	7.71 Km	65.6
5	Protected	Tapkan PF	W	4.19 Km	49.42

Source: ESIA consultants

Table 4.12: Details of Chainage wise Forest Land (in Ha) in HORC Project

Palwal		Nuh		Gurugram		Jhajjar		Sonipat		Grand Total (in Hect.)
Chainage (M)	Area (Ha)	Chainage (M)	Area (Ha)	Chainage (M)	Area (Ha)	Chainage (M)	Area (Ha)	Chainage (M)	Area (Ha)	
-1.501	0.5980	19+900	0.5383	6+000 to 6+400	2.7898	64+300	0.0427	99+760	0.0720	21.4232
-0.317	0.0921	21+440	0.1056	7+342	0.1709	65+000	0.1491	101+382	0.0138	
1+000	0.0772	23+000	0.5383	7+642	0.1766	66+600	0.3217	111+900	0.1750	
1+750	0.0524	Tunnel	7.5890	7+078	0.2441	70+500	0.1755	112+500	0.0090	
2+796	0.0191	27+000	0.4806	10+024	0.0272	71+300	0.0103	115.5000	0.2350	
3+685	0.0035	30+006	0.3405	10+858	0.1661	74+600	0.3066	116+500	0.0714	
		31+114	0.0156	11+620	0.1710	79+100	0.1177	117+900	0.0780	
		31+939	0.0242	44+100	0.0028	80+000	0.1274	119+900	0.0338	
		33+073	0.0145	44+640	0.0708	81+400	0.1436	120+100	0.0430	
				46+200	0.6752	83+000	0.0907	123+300	0.0243	
				52+500	2.0727	86+080	0.1289			
				54+500	0.0805	86+500	0.2476			
				55+930	0.0282	91+200	0.0295			
				58+450	0.0066	91+400	0.0688			
				58+450	0.0234	91+600	0.1975			
				58+500	0.0363	94+900	0.0912			
						96+050	0.1038			
						96+100	1.0842			
Total	0.8423		9.6466		6.7422		3.4368		0.7553	

Source: HRIDC

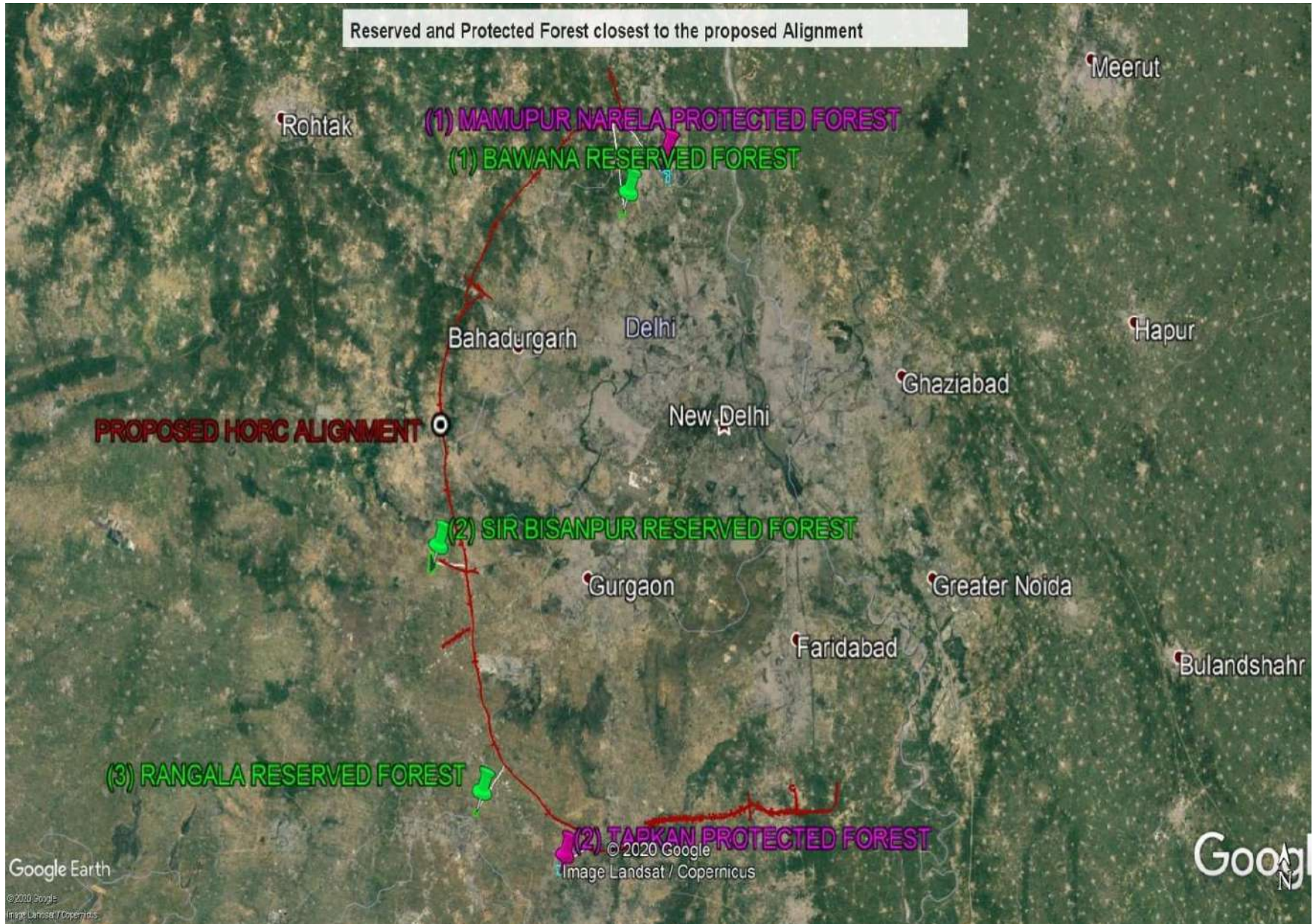


Figure 4.11: Reserved and Protected Forest Closest to the Proposed Alignment

b) Diversity of Fauna (Avifauna) in the Study Area

The assessment of fauna have been done on the basis of secondary data collected from different government offices like forest department, wildlife department etc. The studies area is very rich for avi-faunal diversity due to presence of Sultanpur Lake, lake near Jhajjar district and a many small ponds. As per the secondary source (Haryana Forest Department), every year more than 100 migratory species of birds arrive at Sultanpur in search of feeding grounds and to pass the winter season. The scientific name, local/common name and IUCN status of these birds is given in **Table 4.13**. Out of the 188 species of birds, 122 species are least concern (LC), 6 species are near threatened (NT), 5 species are vulnerable (VU) and 1 species (*Neophron percnopterus*) is endangered

Migratory bird species of winter season in the project area are observed to be Siberian crane, spot-billed pelican, gadwall, wood sandpiper, spotted sandpiper, Eurasian wigeon, greater flamingo, ruff, black-winged stilt, Eurasian teal, common greenshank, northern pintail, yellow wagtail, white wagtail, northern shoveler, rosy pelican, black-tailed godwit, spotted redshank, starling, blue throat and long-billed pipit. In summer, species of migratory birds observed/found are Asian koel, black-crowned night heron, grey heron, knob-billed duck, blue-cheeked bee-eater, blue-tailed bee-eater and cuckoos.

The common Resident birds are Indian roller, white-throated kingfisher, hoopoe, paddy field pipit, purple sunbird, little cormorant, Indian cormorant, common spoonbill, crested lark, red-vented bulbul, rose-ringed parakeet, red-wattled lapwing, shikra, Eurasian collared dove, red collared dove, grey francolin, black francolin, Indian spot-billed duck, painted stork, black-necked stork, white ibis, black-headed ibis, little egret, great egret, cattle egret, laughing dove, spotted owl, rock pigeon, magpie robin, greater coucal, weaver bird, bank mynah, common mynah and green bee-eater. The detail of migration and migratory route is given in **Annexure 4.1**.

Table 4.13: Checklist of Birds in Sultanpur National Park

S. No.	Scientific Name	Common name/ Local name of Birds	IUCN Status
1	<i>Accipiter trivirgatus</i>	Crested Goshawk/Euresian Sparrowhawk	LC
2	<i>Accipiter virgatus</i>	Besra	LC
3	<i>Accipiter badius</i>	Shikra	LC
4	<i>Accipiter nisus</i>	Sparrow-Mawk	LC
5	<i>Acridotheres tristis</i>	Common Myna	-
6	<i>Acridotheres fusca</i>	Jangla Myna	-
7	<i>Acridotheres ginginianus</i>	Bank Myna	-
8	<i>Acrocephalus stentorus</i>	Indian great reed Warbler/Clamorot	-
9	<i>Actitis hypoleucos</i>	Common Sandpiper	LC
10	<i>Alauda gulgula</i>	Oriental Sykelark	LC
11	<i>Alcedo atthis</i>	Common Kingfisher	LC
12	<i>Amandava amandava</i>	Red Avadavat	LC
13	<i>Amaurornis phoenicurus</i>	Whitbreasted Waterhen	-
14	<i>Anas acuta</i>	Northern pintail	LC
15	<i>Anas clypeata</i>	Northern shoveller	LC
16	<i>Anas crecca</i>	Common teal	LC
17	<i>Anas penelope</i>	Eurasian wigeon	LC
18	<i>Anas platyrhynchos</i>	Mallard	LC

S. No.	Scientific Name	Common name/ Local name of Birds	IUCN Status
19	<i>Anas poecilorhyncha</i>	Spot-billed Duck	LC
20	<i>Anas querquedula</i>	Garganey	-
21	<i>Anas strepa</i>	Gadwall	-
22	<i>Anastomus oscitans</i>	Asian Openbill(Open billed stork)	LC
23	<i>Anhinga melanogaster</i>	Darter	NT
24	<i>Anhus similis</i>	Long-billed pipit	-
25	<i>Anser indicus</i>	Barheaded Goose	LC
26	<i>Anthracoceros coronatus</i>	Malabar Pied Hornbill	NT
27	<i>Anthus hodgsoni</i>	Olive-backed Pipit	LC
28	<i>Anthus rufulus</i>	Paddyfield pipit	LC
29	<i>Anthus trivialis</i>	Tree Pipit	LC
30	<i>Apus affinis</i>	House Swift	LC
31	<i>Aquila rapax</i>	Tawan Eagle	VU
32	<i>Aquila hastata</i>	Indian spotted eagle	VU
33	<i>Ardea cinerea</i>	Grey Heron	LC
34	<i>Ardea purpurea</i>	Purple Heron	LC
35	<i>Ardeola grayii</i>	Indian Pond Heron	LC
36	<i>Artamus fuscus</i>	Ashy Woodswallow	LC
37	<i>Asio flammeus</i>	Short eared owl	-
38	<i>Athene brama</i>	Spotted Owlet	LC
39	<i>Aythya ferina</i>	Common pochard	VU
40	<i>Aythya fuligula</i>	Tufted Duck	LC
41	<i>Bubo bubo</i>	Eurasian Eagle Owl	LC
42	<i>Bubo nipacensis</i>	Indian Eagle Owl	-
43	<i>Bubulcus ibis</i>	Cattle Egret	LC
44	<i>Burhinus oedicephalus</i>	Eurasian Thickknee	LC
45	<i>Butastur teesa</i>	White-eyed buzzard	LC
46	<i>Butorides striatus</i>	Little Heron	-
47	<i>Coccyzus merulinus</i>	Plaintive Cuckoo	-
48	<i>Coccyzus sonneratii</i>	Banded Baycuckoo	-
49	<i>Caprimulgus affinis</i>	Savanna Nightjar	LC
50	<i>Caprimulgus asiaticus</i>	Indian Nightjar	LC
51	<i>Caprimulgus indicus</i>	Grey Nightjar	LC
52	<i>Caprimulgus albus</i>	Great Egret	-
53	<i>Celeus brachyurus</i>	Rufous Woodpecker	LC
54	<i>Centropus bengalensis</i>	Lesser coucal	LC
55	<i>Cephalopyrus flammiceps</i>	Fire-capped Tit	LC
56	<i>Ceryle lugubris</i>	Lesser pied kingfisher	-
57	<i>Chalcophaps indica</i>	Emerald Dove	LC
58	<i>Charadrius dubius</i>	Little Ringed Plover	LC
59	<i>Charadrius leschenaulti</i>	Greater sand plover	LC
60	<i>Chloropsis aurifrons</i>	Golden fronted leaf bird	LC
61	<i>Ciconia episcopus</i>	Wolly-necked Stork(White necked Stork)	NT
62	<i>Ciconia nigra</i>	Black Stork	LC

S. No.	Scientific Name	Common name/ Local name of Birds	IUCN Status
63	<i>Circus melanoleucos</i>	Marsh Harrier	LC
64	<i>Circus pygargus</i>	Montangu's harrier	LC
65	<i>Cisticola juncidis</i>	Streaked Fantail Warbler/Zitting Cisticola	LC
66	<i>Clamator jacobinus</i>	Pied Cuckoo	LC
67	<i>Coracias benghalensis</i>	Indian Roller	LC
68	<i>Coracina macei</i>	Large Cuckooshrike	LC
69	<i>Coracina melanoptera</i>	Black-headed Cuckooshrike	LC
70	<i>Corvus macrorhync</i>	Jungle Crow	LC
71	<i>Corvus splendens</i>	House Crow	-
72	<i>Cuculus canorus</i>	Euresian Cuckoo	LC
73	<i>Cuculus micropterus</i>	Indian Cuckoo	LC
74	<i>Cuculus poliocephalus</i>	Lassar Cuckoo	LC
75	<i>Culicicapa ceylonensis</i>	Grey-Headed Canary Flycatcher	LC
76	<i>Curisorius cormomondelicus</i>	India Courser	-
77	<i>Cyornis tickelliae</i>	Tickell's Blue Flycatcher	LC
78	<i>Dendrocitta vagabunda</i>	Rufous Treepie (India Treepie)	LC
79	<i>Dendrocopos hyperythrus</i>	Rufous billed woodpecker	LC
80	<i>Dendrocopos nanus</i>	Browncapped pigmy woodpecker	LC
81	<i>Dendrocygna bicolor</i>	Fulvous whistling duck	-
82	<i>Dendrocygna javanica</i>	Lesser whistling duck	LC
83	<i>Dendrocygna javanica</i>	Lesser whistling shelduck	LC
84	<i>Dicaeum erythrorhynchos</i>	Thick-billed Flowerpecker	-
85	<i>Dicruurus hottentottus</i>	Spangled Drongo	-
86	<i>Dicrurus leucophaeus</i>	Ashy Dronga	LC
87	<i>Dinopium macrocercus</i>	Black Dronga	-
88	<i>Dinopium benghalensis</i>	Black-rumped woodpecker	-
89	<i>Dinopium shorii</i>	hHimalayan flame back	LC
90	<i>Dupetor flavicollis</i>	Black bittern	LC
91	<i>Egretta garzetta</i>	Little Egret	LC
92	<i>Elanus caeruleus</i>	Black-Shouldered Kite	LC
93	<i>Emberiza buchanani</i>	Grey-Necked Bunting	LC
94	<i>Ephippio rynchus</i>	Black Necked stork	-
95	<i>Estrilda formosa</i>	Green Munia	VU
96	<i>eudynamys scolopacea</i>	Asian koel	LC
97	<i>Falco peregrinus</i>	Peregrine Falcon/Saheen falcon	LC
98	<i>Falcon tinnunculus</i>	Common Kestrel (European kestrel)	-
99	<i>Falcon jugger</i>	Lagger falcon	-
100	<i>Ficedula parva</i>	Red Throated Flycatcher	LC
101	<i>Ficedula superciliaris</i>	Ultramarine Flycatcher	LC
102	<i>Franconlinus francolinus</i>	Black francolin	-
103	<i>Francolinus pictus</i>	Painted Francolin/Patridge patridge	LC
104	<i>Francolinus pondicerianus</i>	Grey Francolin /Grey patridge	LC
105	<i>Fulica atra</i>	Common coot	LC
106	<i>Galerida deve</i>	Crested lark /syke Lark	-

S. No.	Scientific Name	Common name/ Local name of Birds	IUCN Status
107	<i>Gallinago gallinago</i>	Common snipe	LC
108	<i>Gallinula chloropus</i>	Common moorhen	LC
109	<i>Galloperdix spadicea</i>	Red spurfowl	LC
110	<i>Glareola lactea</i>	Small pratincole	LC
111	<i>Glaucidium radiatum</i>	Jungle owlet	LC
112	<i>Grus antigones</i>	Sarus crane	-
113	<i>Grus gurs</i>	Common crane	-
114	<i>Grus virgo</i>	Demoiselle crane	LC
115	<i>Halcyon capensis</i>	Stork-billed kingfisher	-
116	<i>Halcyon smymensis</i>	White-throated kingfisher	-
117	<i>Haliastur indus</i>	Brahimny kite	LC
118	<i>Hemipus picatus</i>	Pied Flycontsher shrike	LC
119	<i>Hieraetus pennatus</i>	Booted eagle	LC
120	<i>Hieraetus fasciatus</i>	Bonelli's Eagle	-
121	<i>Hierococcyx varius</i>	common Hawk cuckoo/Brain Fever Bird	LC
122	<i>Himantopus himantopus</i>	Black-winged stilt	LC
123	<i>Hirundo concolor</i>	Dusky crag martin	LC
124	<i>Hirundo daurica</i>	Red-rumped swallow	-
125	<i>Hirundo fluvicola</i>	Streak-throated swallow (cliff swallow)	LC
126	<i>Hirundo rustica</i>	common swallow/bam swallow	LC
127	<i>Hydrophasianus chirugus</i>	Pheasant-tailed jacana	-
128	<i>Hyopothymis azurea</i>	Common lora	-
129	<i>Lctinaetus malayensis</i>	Black Eagle	-
130	<i>Jynx torquilla</i>	Eurasian Wryneck	LC
131	<i>Ketupa zey</i>	Brown fish owl	LC
132	<i>Lanius cristatus</i>	Brown shrike	LC
133	<i>Lanius meridionalis</i>	Southerl Grey shrike	VU
134	<i>Lanius vittatus</i>	Bay-backed shrike	LC
135	<i>Larus brunnicephalus</i>	Brown-headed Gull	LC
136	<i>Leptotilis adjutant</i>	Lasser Adjutant	-
137	<i>Limosa lappopnila</i>	Bar tailed godwit	-
138	<i>Limosa limosa</i>	Black tailed godwit	NT
139	<i>Lonchura malabarica</i>	India silverbill	LC
140	<i>Lonchura punctulata</i>	Scaly-breasted munia (Spotted munia)	LC
141	<i>Lonchura striata</i>	white-rumped munia	LC
142	<i>Luscinia svecica</i>	Blue throat	LC
143	<i>Magalaima haemacephala</i>	Coppersmith Barbet	-
144	<i>Megalaima zeylanica</i>	Brown-headed Barbet	-
145	<i>Melophus lathami</i>	Crested Bnuting	LC
146	<i>merops persics</i>	Blue cheeked bee eater	-
147	<i>Mesophoxyx intermedia</i>	Intermediate Egret	-
148	<i>Metopidius indicus</i>	Bronze-winged Jacana	LC
149	<i>Milvus migrans</i>	Black kite/101ariah kite	LC
150	<i>Milveus migrans</i>	Red winged Bush Lark/Indian Bush Lark	-

S. No.	Scientific Name	Common name/ Local name of Birds	IUCN Status
151	<i>Monticola cincloryhnchus</i>	Blue-headed Rock Thrush	-
152	<i>Motacilla alba</i>	white wagtail	LC
153	<i>Motacilla cinerea</i>	Grey wagtail	LC
154	<i>Motacilla flava</i>	Yellow wagtail	LC
155	<i>Motacilla madraspatensis</i>	white-browed wagtail (Large pied wagtail)	-
156	<i>Muscicapa dauurica</i>	Asian Brown Flycatcher	LC
157	<i>Mycteria bucocephala</i>	Painted stork	-
158	<i>Myiophous horsefieldii</i>	Malabar whisting Thrush	-
159	<i>Nectarinia asiatica</i>	Purple sunbird	LC
160	<i>Nectarinia zeylonica</i>	Purple-rumped sunbird	LC
161	<i>Neophron percnopterus</i>	Egyptian vulture (Indian Scavenger Vulture)	EN
162	<i>Netta rufina</i>	Red crested pochard	LC
163	<i>Niox scutulata</i>	Brown Hawk owl	-
164	<i>Numenius arquata</i>	Eurasian Eagle	NT
165	<i>Nyctyornis athertoni</i>	Blue-bearded bee-eater	LC
166	<i>Ocyrceros birostris</i>	Indian Grey hornbill	LC
167	<i>Oneanthe alboniger</i>	Hume's Wheatear	-
168	<i>Oriolus oriolus</i>	Eurasian Golden oriole	LC
169	<i>Oriolus xanthornus</i>	Black-Hooded oriole	LC
170	<i>Orthotomus sutorius</i>	Common Tailorbird (Tailor bird)	LC
171	<i>Otus bakkamoena</i>	Collared scops owl	LC
172	<i>Pandion haliaetus</i>	Osprey	LC
173	<i>Parus xanthogenys</i>	Black -lored Tit (yellow cheeked tit)	LC
174	<i>Passer domesticus</i>	House sparrow	LC
175	<i>Pavo cristatus</i>	Peacock	LC
176	<i>Pelecanus Crispus</i>	Dalmatian pelican	NT
177	<i>Pelecanus onocrotalus</i>	Great white pelican	LC
178	<i>Pellorneum ruficeps</i>	Puff-throated Babbler (Spotted Babbler)	LC
179	<i>Perdicula agroondah</i>	Rock Bushquail	-
180	<i>Perdicula asiatica</i>	Jungle Bushquail	LC
181	<i>Pericrocotus erythropygius</i>	White-bellied Minivet	LC
182	<i>Pericrocotus flammeus</i>	Scarlet Minivet	LC
183	<i>Pernis ptilorhyncus</i>	Oriental Honey Buzzard	LC
184	<i>Phaenicophaeus leschenaultii</i>	Sirkeer Malkoha	LC
185	<i>Phalacrocorax niger</i>	Little cormorant	-
186	<i>Phalacrocorax fuscicollis</i>	Indian Cormorant	-
187	<i>Phalacrocorax pugnax</i>	Ruff	-
188	<i>Phoenicopterus</i>	Lesser flamingo	-

Source: Haryana Forest Department

c) National Parks, Wildlife Sanctuaries, Biosphere Reserves

The Haryana state of north India has 2 National Parks, 8 Wildlife Sanctuaries, 2 Wildlife Conservation Areas, 4 Animal & Bird Breeding Centers, 1 Deer park and 50 herbal parks which are managed by the Forests Department, Government of Haryana (**Figure 4.12 A**).

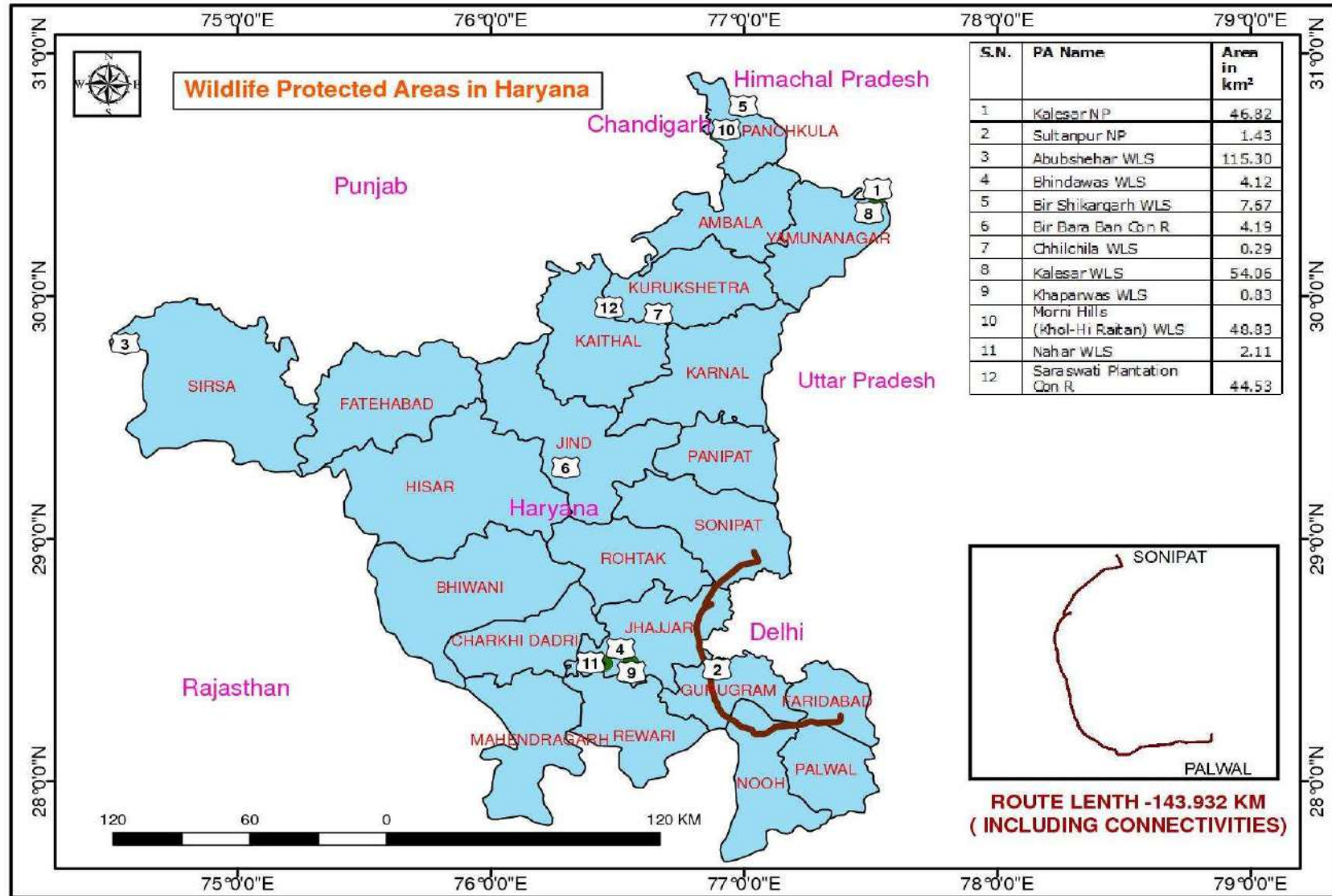


Figure 4.12 (A): Map Showing National Parks and Wildlife Sanctuaries of Haryana State with Proposed HORC Alignment (Source: ENVIS, WII)

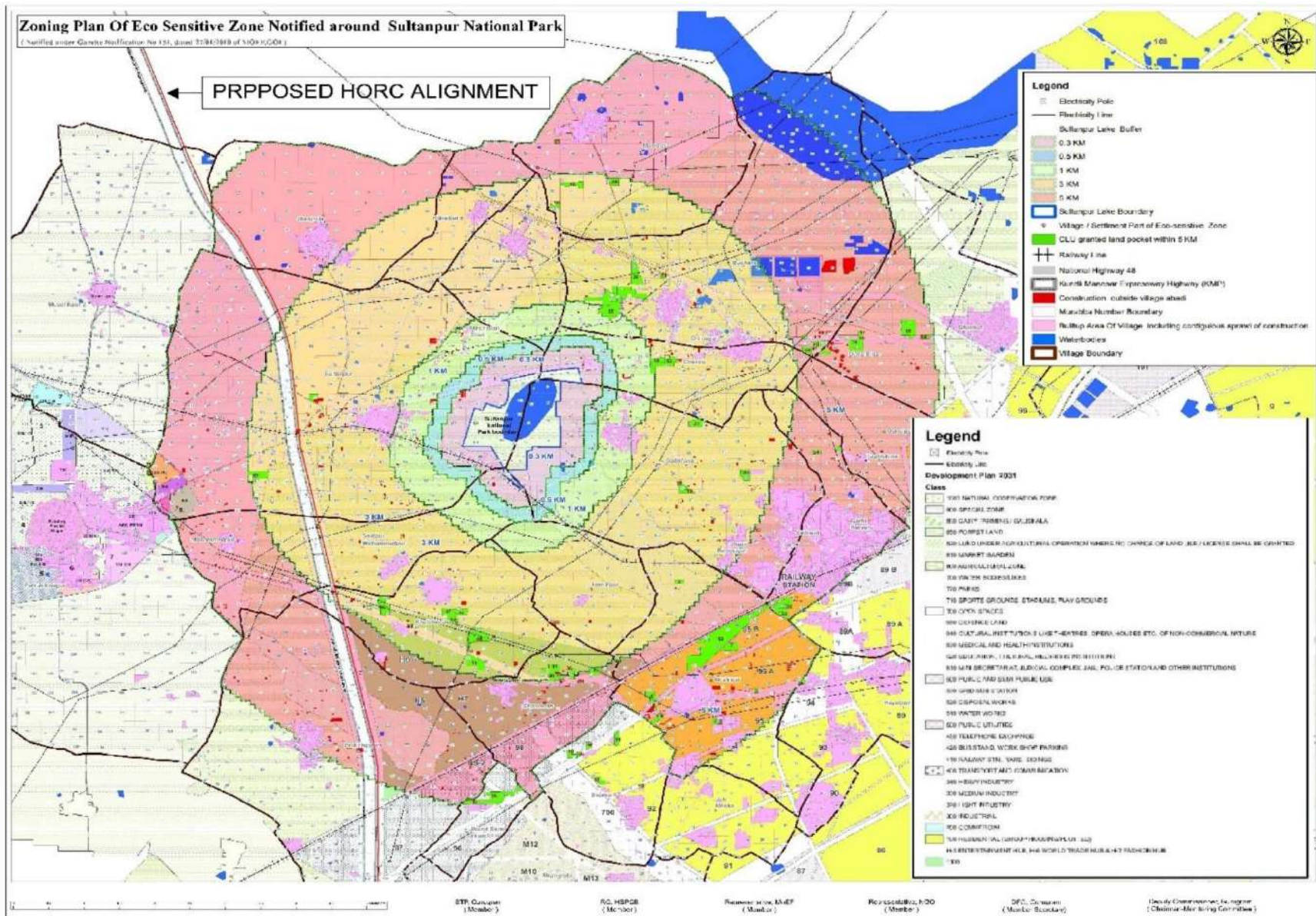


Figure 4.12 (B): Map showing Eco-Sensitive Zone of Sultanpur National Park and Proposed HARC Alignment

. The nearest eco-sensitive area from the project alignment is Sultanpur National Park in Gurugram which is about 2.3 Km (**Figure 4.12 B**) on the left side of alignment in up to downstream direction, covering an area of 142.52 hectares and known for birds conservation.. The Gazette Notification of Sultanpur National Park is available at http://www.wiienviis.nic.in/Database/Haryana_7822.aspx.

Sultanpur National Park, notified as National Park vide notification no. S.O 81/C.A 53/72/S35/91 dated 05/07/1991 is located at Sultanpur village on Gurugram-Jhajjar highway, Haryana. Sultanpur National Park is famous for its migratory as well as resident birds. The major faunal species are Common hoopoe, paddy field pipit, purple sunbird, little cormorant, Indian cormorant, common spoonbill, gray francolin, black francolin, Indian roller, white-throated kingfisher, spot bill, painted stork, black-necked stork, white ibis, black-headed ibis, little egret, great egret, cattle egret, crested lark, red vented bulbul, rose-ringed parakeet, red-wattled lapwing, shikra, Eurasian collared dove, red-collared dove, laughing dove, spotted owl, rock pigeon, magpie robin, greater coucal, weaver bird, bank mynah, common mynah and green bee-eater.

The vegetation of Sultanpur National Park and its surrounding area falls under sub group 6B Northern Tropical Thorn Forest belonging to group II Dry Tropical Forest as per Champion and Seth (1968) classification. The vegetation is represented by tree species belonging to genus *Acacia*, *Azadirachta* and *Prosopis*. Xerophytes plants are almost throughout the National Park. The park area has maximum canopy of tree species with seasonal ground flora. The common species of the Sultanpur national park are *Acacia auriculiformis*, *Acacia nilotica*, *Acacia tortilis*, *Acacia farnesiana*, *Prosopis glandulosa*, *Morus alba*, *Prosopis juliflora*, *Pongamia pinnata*, etc.

Sultanpur National park falls under Key Biodiversity Area (KBA) as per International Union for Conservation of Nature (IUCN). Globally KBAs are designated based on 11 criteria defined under five broad categories of threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and irreplaceability. It is also an Important Bird Areas (IBA) of India as per Bombay natural History Society (BNHS). The IBAs serve as conservation areas for protection of birds at the global, regional or sub-regional level. According to Birdlife International, designation of IBAs is based on standardized criteria, namely (i) hold significant numbers of one or more globally threatened bird species, (ii) be one of a set of sites that together hold a suite of restricted-range species or biome-restricted species and (iii) have exceptionally large numbers of migratory or congregatory birds.

4.3.9 Religious and Cultural Heritage sites

Haryana's great culture and heritage is well preserved in its rural towns and villages. The project area is prosperous in its built and natural Heritage. Many ground-breaking tales of mythology and history were known to associate with this region which changes the fate of India. There are Built Heritage and Natural Heritage. The main identified Tourist and Heritage sites in project region are given **Table 4.14**. These sites will not be affected directly from the project. Moreover, project will provide better connectivity to these sites. And hence likely impact will be positive. The detail of centrally protected and state protected monuments/ heritage is given in **Annexure- 4.2**.

Table 4.14: District – Wise Major Religious and Cultural Heritage Sites

Secondary Source				Aerial distance from alignment (Km)
S. No.	District	Name of Built Heritages and Tourism	Natural Heritage	
1	Palwal	Panchwati Temple, 9 no. of Kos Minar	-	14.10km
2	Gurugram	Baoli Ghas Ali Shah (Farukhnagar) Mosque of Ala Vardi Khan (Sarai Ala Vardi Khan) Sheesh Mahal (Farrukh Nagar)	Sultanpur National Park Sohna sulphur springs (Sohna)	3.30km
3	Jhajjar	Group of Monuments	Bhindawas Birds Sanctuary	14.25km
4	Sonipat	7 No. of Mughal Kos Minar (Gannaur, Akbarpur Barota, Jawa Hari, Panchi Gujran, Rajpur, Sonipat and Jagdish pur) Tomb of Khwaja Khizer	-	6.60km

Source: Field Study

There is no place of archaeological, historical, religious or tourist interest within the 500 meters area of proposed HORC track on either side. Five site/monuments of centrally protected monument (ASI) and three site/monuments of state protected monument under Department of Archeology and Museum are found in 10 km buffer on either sides of proposed alignment. The detail of centrally and state protected Archeological sites/monuments within 10 Km Buffer of proposed alignment is given in **Table 4.15**. The complete list of centrally and state protected Archeological sites/monuments of Haryana State is given in **Annexure 4.2**.

Table 4.15: Archeological Sites/Monuments within 10 Km Buffer of Proposed HORC Alignment

S. No.	Monument Name	Location	District	Side of alignment	Arial distance from alignment (Km)
Centrally Protected Monument under ASI (Archeological Survey of India)					
1	Kos Minar No 16	Gudhpuri	Palwal	At the start point of alignment	4.90
2	Kos Minar No 17	Gudhpuri	Palwal	Right	6.86
3	Old Mughal Kos Minar adjoining the north-western railway in Sonapat Tehsil	Akbarpur Barota	Sonapat	Right	2.30
4	Old Mughal Kos Minars adjoining the North-Western railway in Sonapat Tehsil	Baiyanpur	Sonapat	At the end point of alignment	1.08
5	Baoli Ghaus Ali Shah	Farukh Nagar	Gurugram	Left	3.66
State Protected Monument under Department of Archeology and Museum, Haryana					
1	Sheesh Mahal	Farukh Nagar	Gurugram	Left	4.0
2	Lal Ghumbad	Sap ki Nangli, Sohna	Gurugram	Right	4.5
3	Qutub khan ki Masjid	Chungi block, Sohna	Gurugram	Right	6.0

Source: Archaeology and Museum, Haryana

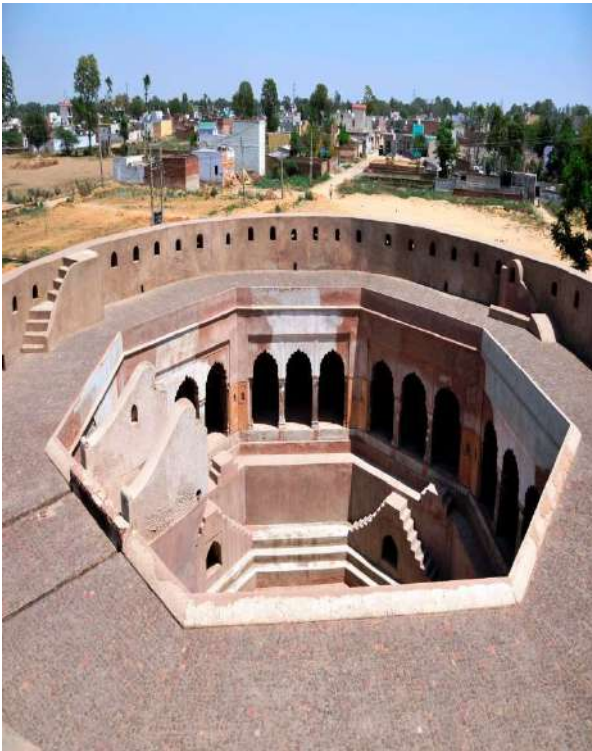
Plate 4.1: Archeological Sites/Monuments within 10 Km Buffer of Proposed Alignment



Kos Minar No 16, Palwal



Kos Minar No 17, Palwal



**Baoli Ghaus Ali Shah, Farukh Nagar,
Gurugram**



**Old Mughal Kos Minar Adjoining the North-
Western Railway in Sonapat Tehsil**

4.4 PRIMARY ENVIRONMENTAL BASELINE DATA COLLECTION

Ambient air, noise, soil and water quality samples were collected at important locations to assess environment quality and to prepare a baseline database. The detailed methodology for baseline data collection and sampling procedure is given in **Annexure – 1.3**.

4.4.1 Remote Sensing and GIS Application

Remote sensing technology has emerged as a powerful tool in providing reliable information on various natural resources at different levels. It has played an important role in effective mapping and periodic monitoring of natural resources including environment.

With the availability a high resolution remote sensing data, newer areas of remote sensing applications have been Identified, techniques of data processing have been unproved and computer based image processing system have become effective,

Based on these applications, the land use studies refer to man's activities on land, utilitarian in nature whereas land cover denotes the vegetation cover, water bodies, artificial constructions and habitation. Land use and Land cover classification system standardized by department of space, for mapping different agro-climatic zones has been adopted. The classification systems are as follows:

Build Up land: it is defined as human habitation developed due to non- agricultural use and which has a cover of building, transport, communication utilities is association with water, vegetation and vacant lands.

Land with or without Scrub: They occupy (relatively) higher topography like up lands or high ground with and without scrubs. These lands are generally prone to degradation or erosion. These exclude hilly and mountainous terrain.

Fallow Land: It is described as agricultural lands which is taken up for cultivation, but is temporarily allowed to rest on- cropped for one or two cultivation, but not less than one year. Fallow lands are particularly those which are seen devoid of crops at the time when the imagery is taken of both seasons.

Dense Evergreen Forest: It is described as forest, which comprises of thick and dense canopy of all trees, which predominantly remain green throughout the year. It includes both coniferous and tropical broad-leaves evergreen trees. Semi- evergreen forest is a mixture of both deciduous and evergreen trees but latter predominate.

4.4.2 Land use of study area

The land use and land cover of the project area were studied from December 2020 to February 2021.

a) Objective: The objectives of land use studies are

- To determines the present land use pattern;
- To determine the drainage pattern present in the study area.

Data used

A: Remote sensing data

- Landsat 8 Pan sharpened image;
- IRS P5 Carto Sat data.

b) Methodology

The land use pattern of the study area was studied by analyzing the available secondary data published in the district primary census abstract of the year 2011.

Salient Features of the Adopted Methodology are Given Below:

- Acquisition of satellite data;
- Preparation of base map from survey of India toposheet and Landsat 8 image;
- Data analysis using digital image processing (DIP);
- Ground truth studies or field checks using GPS;
- Finalization of the map;
- Digitization using head up vectorization method;
- Area calculation for statistic generation;
- Masking.

The spatial resolution and the spectral bands in which the sensor collects the remotely sensed data are two important parameters for any land use survey. Landsat 8 Pan sharpened image data after spatial resolution of 15.0 m with the swath width of 180 km. The data is collected in four visible bands namely green (Band 2) (0.52-0.59 μ), red (bands) (0.62-0.68 μ), near infrared (NIR) (B and 4) (0.76-0.86 μ) with orbit repeat period of 24 days (three days revisit) and radiometry best out of 10 bits. The shapes, sizes, colors tone and texture of several geomorphic features are visible in IRS data.

Four spectral bands provided high degree of measurability through band combination including FCC generation, band rationing, classification etc. these features of the IRS data are particularly important for better comprehensive and delineation of the land use classes. Hence, IRS P6 LISS-III data and IRS-P5-Carto SAT-1 data having 10 m spatial resolution having pan chromatic imaginary was used for land use mapping.

The digital image processing was performed on ARC GIS 10.4 software system on high configured computer. This software package is a collection of image processing functions necessary for pre-processing, rectification, band combination, filtering, statistics, classification etc. Apart from contrast stretching, there is large no. of image processing function that can be performed on the section. ARC GIS map 10.4 is used for the final layout presentation.

Supervised classification using the entire spectral band can separate fairly accurately, the different land use classes at level II on the basis of the spectral responses, which involve the following three steps:

1. Acquisition of ground truth
2. Calculation of the statistics of training area
3. Classification using maximum likelihood algorithm

The training areas for classification were homogenous, well sprayed through the scene with boarding pixels excluded is processing. Several training sets were used through the scene for similar land use classes. After

evaluating the statistical parameters of training sets, the training areas were rectified by deleting no congruous training sets creating new ones.

4.4.3 Site Analysis

4.4.3.1 Land Form, land Use

Approx. **655.92 Ha** of land (ROW) will be required for construction and lying of railway line which also includes construction of stations and other facilities. The rail corridor is passing through agricultural land, scanty vegetation and forest area.

4.4.3.2 Pre- Field Interpretation of Satellite Data

The False Colour Composite (FCC) of LISS-4 satellite imagery having 5.6 m spatial resolution satellite data at 1:50,000 scales were used for pre-field interpretation work. Taking the help of topo sheets, geology, geo-morphology and by using the image elements, the classification was made and features were identified and delineated the boundaries roughly. Each feature was identified on image by their image elements like tone, texture, colour, shapes, size, pattern and association. A tentative legend in terms of land cover and land use was formulated. The sample area for field check was selected covering all the physiographic; land use/ land cover features cum image characteristics.

4.4.3.3 Ground Truth Collection

Both topo sheets and imagery were carried for field verification and a transverse plan using existing road network was made to cover as many representative sample areas as possible to observe the broad land use feature and to adjust the sample areas according to field conditions. Details field observations and investigations were carried out and noted the land use features on the imagery.

4.4.3.4 Post field work for Land Use / land Cover Classification

The base maps of the study were prepared with the help of survey of India topo sheets on 1:50,000 scale. Preliminary interpreted land use and land cover features boundaries from IRS-1 sensor LISS-4 having 5.6 m spatial resolution, false color composites were modified in light of field information and the final thematic details were transferred on to the base maps. The final interpreted and classified thematic map was cartography. The cartographic map was categorically differentiate with standard color coding and described features with standard symbols. All the classes were identified and marked by the standard legend on the map. The satellite imaginary of proposed stretch from Palwal to Sonipat and LU and LC Map of Proposed stretch from Palwal to Sonipat of 10 km Buffer Zone of study area are attached below as **Figure 4.13, Figure 4.14. The Land use and land cover breakup is given in Table 4.16.** Land cover classes were derived and classified as under:

1. Agricultural Land
2. Settlement
3. Dense scrub
4. Water bodies
5. Waste land

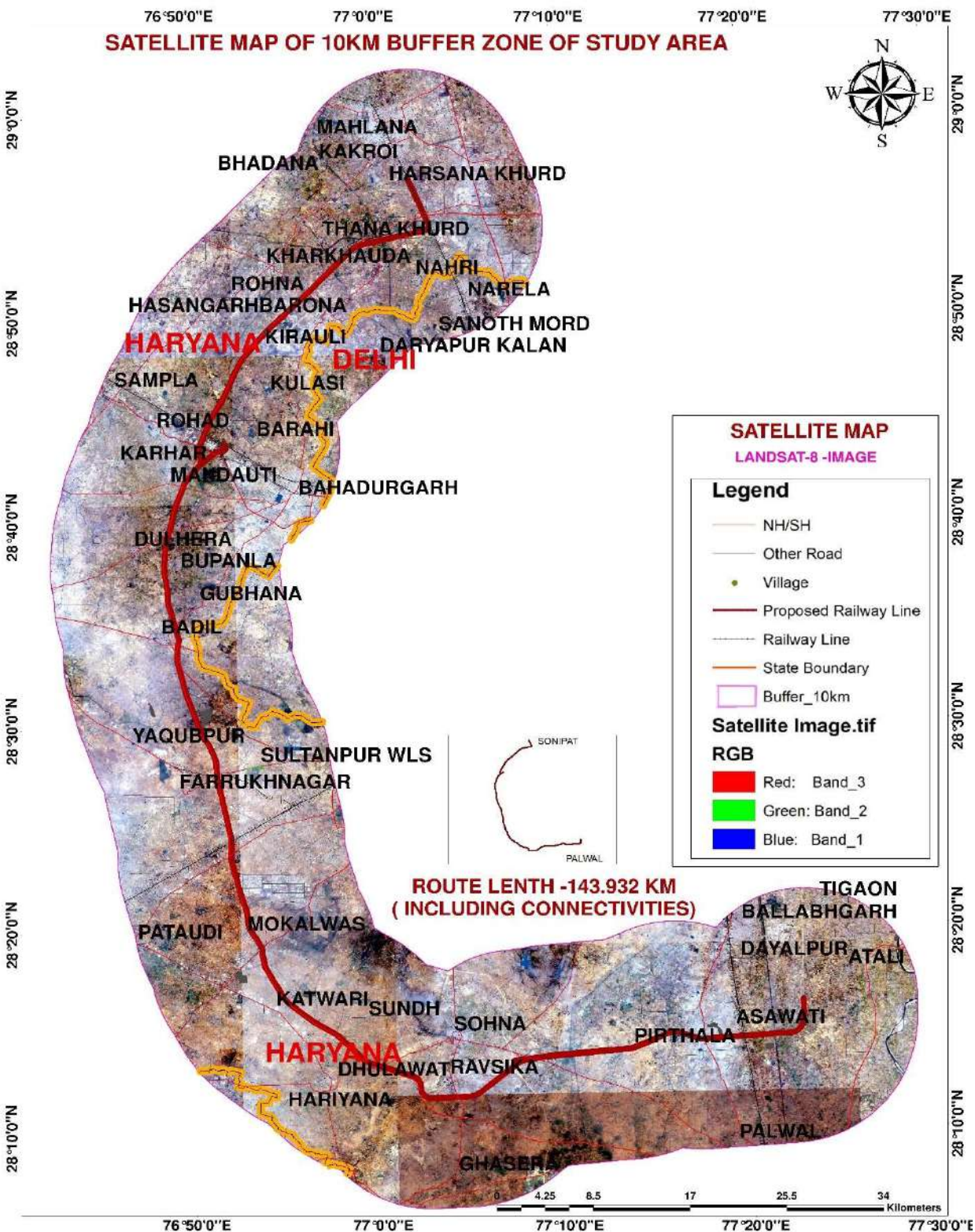


Figure 4.13: Satellite Imaginary of Proposed HARC Stretch from Palwal to Sonipat

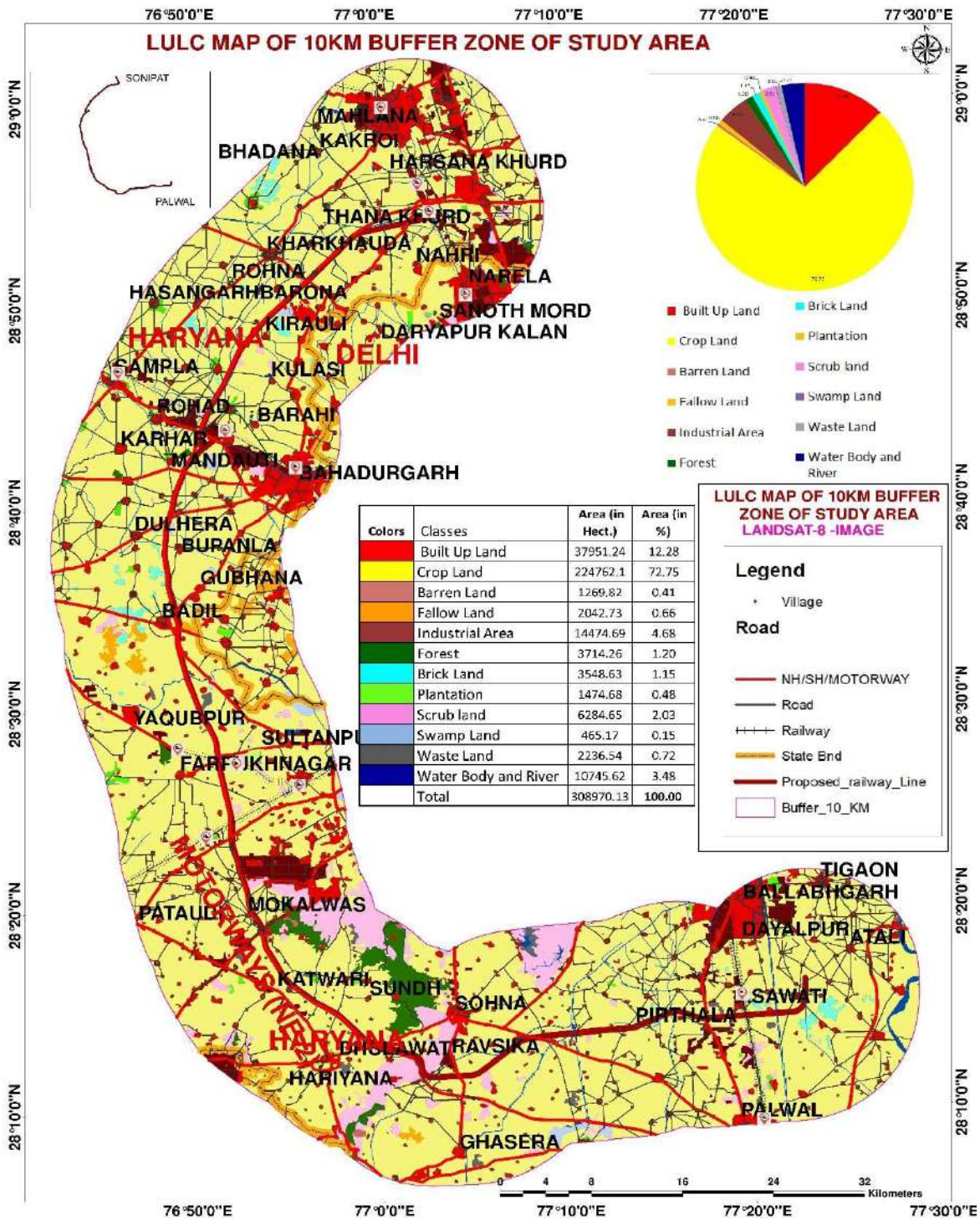


Figure 4.14: LU and LC Map of Proposed HORC Stretch from Palwal to Sonipat

Table 4.16: Land Use and Land Cover Break Up

S. No.	LU/ LC Class	Area (in Hect.)	Area (in %)
1.	Built up land	37951.24	12.28
2.	Crop Land	224762.10	72.75

S. No.	LU/ LC Class	Area (in Hect.)	Area (in %)
3.	Barren Land	1269.82	0.41
4.	Fallow Land	2042.73	0.66
5.	Industrial Area	14474.69	4.68
6.	Forest	3714.26	1.20
7.	Brick Land	3548.63	1.15
8.	Plantation	1474.68	0.48
9.	Scrub Land	6284.65	2.03
10.	Swamp Land	465.17	0.15
11.	Waste Land	2236.54	0.72
12.	Water Body & River	10745.62	3.48
Total		308970.13	100.00

Note* from above table it has been observed that majority of land is covered as crop land covering 224762.10 hectares of land and which accounts **72.75 %** of the total land cover.

a. Summary of LU LC for Rail Route and Stations

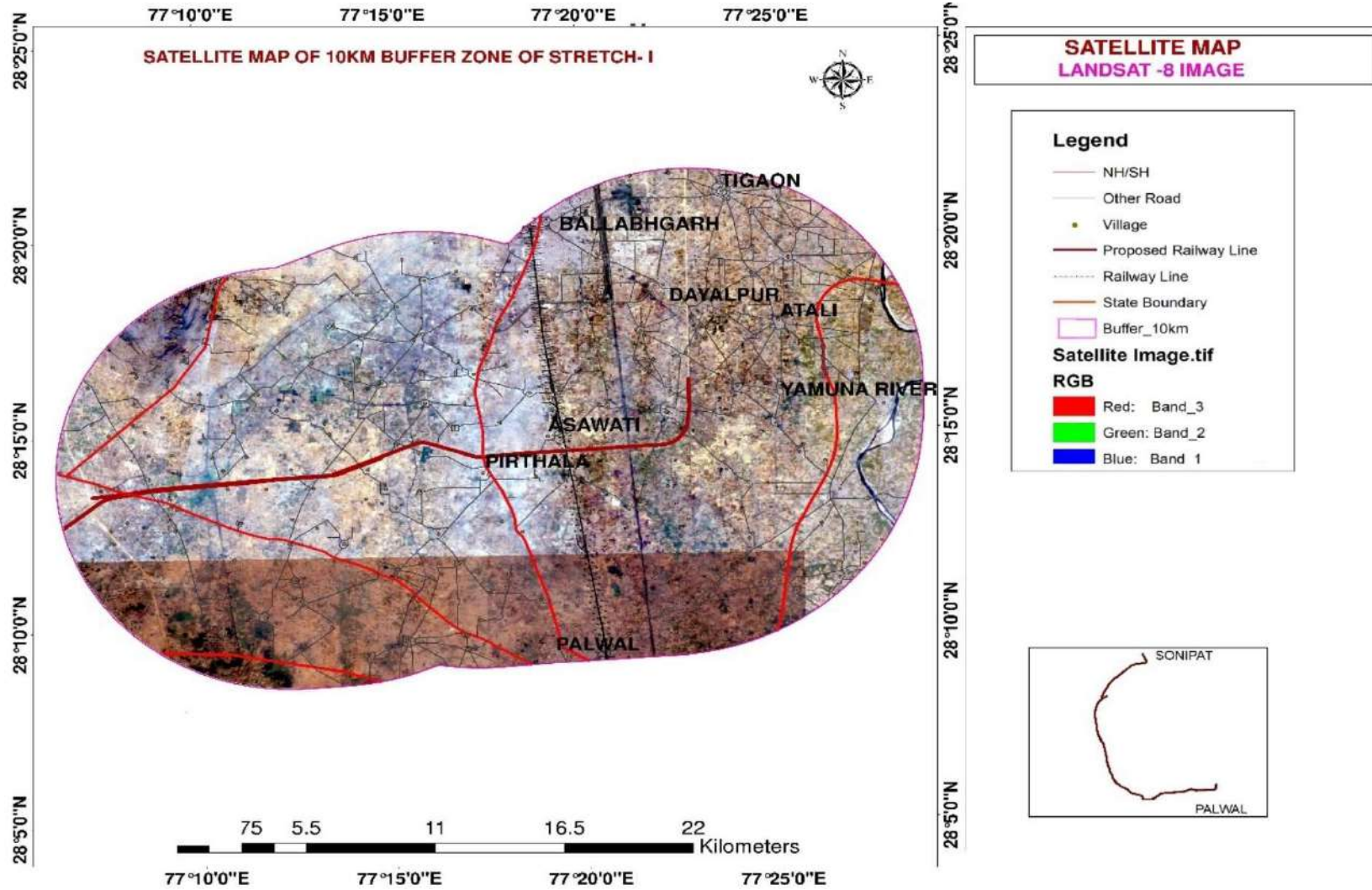
Proposed Rail Alignment

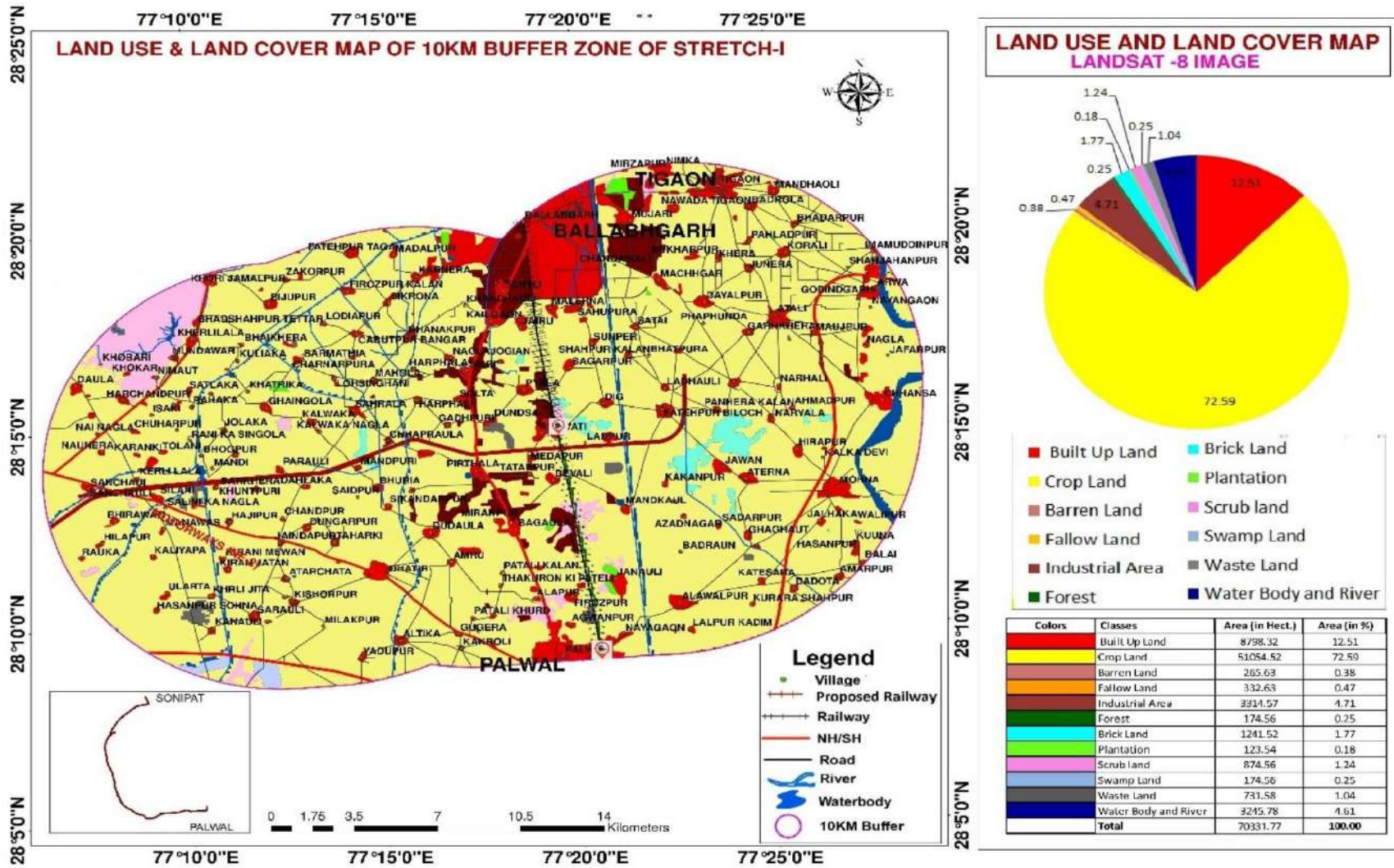
The land use and land cover map were developed for each 20 km segments and classified for different features to identify the land use and land cover pattern along the stretch. It was observed that most of the land is barren, waste land with sparse vegetation. There are national highways, state highways, nallahs, rivers, bridges which are criss-crossing the route. The vegetation or crops are grown throughout the year. Habitations was observed along and nearby to few stretches.. The proposed alignment is passing through habitation of some villages and industrial area.

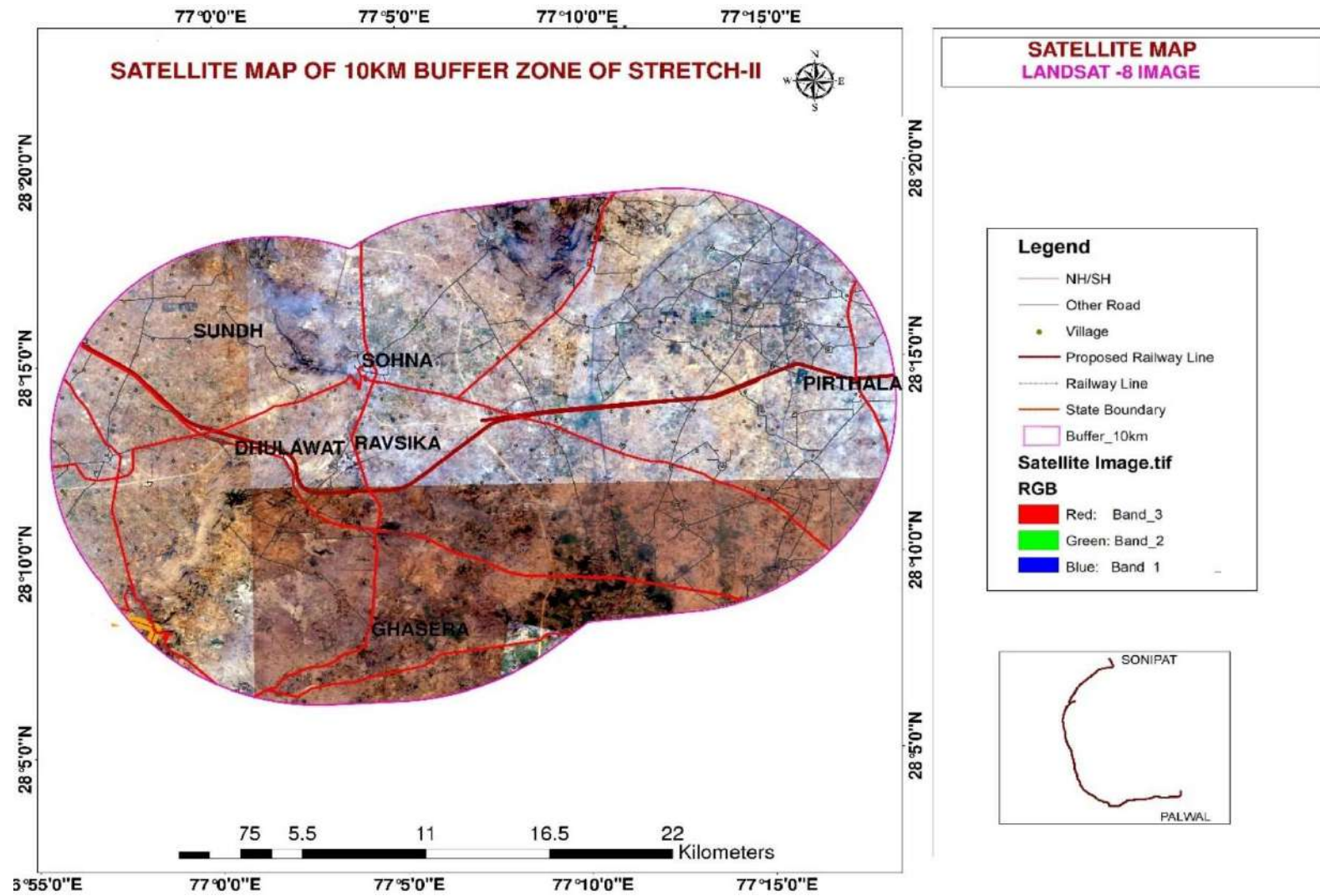
Stations

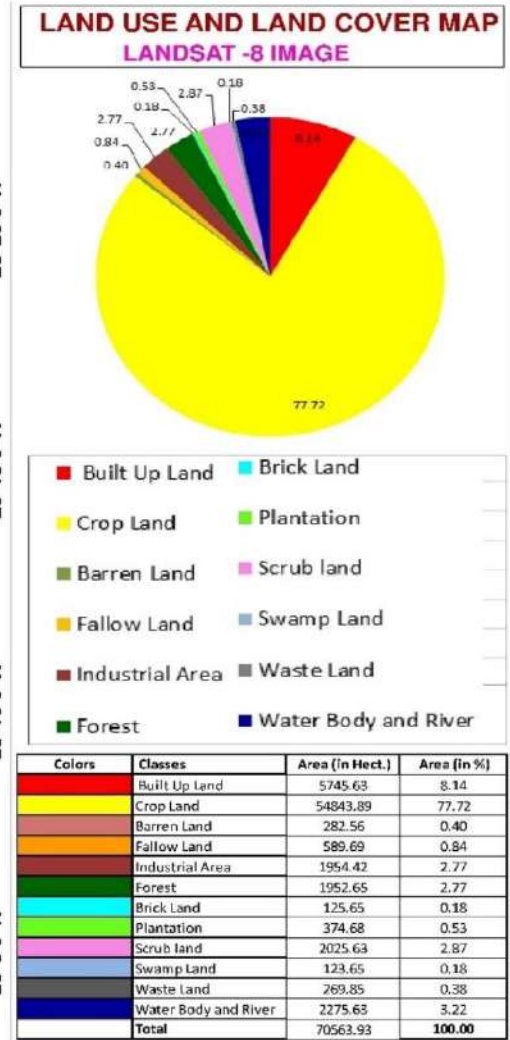
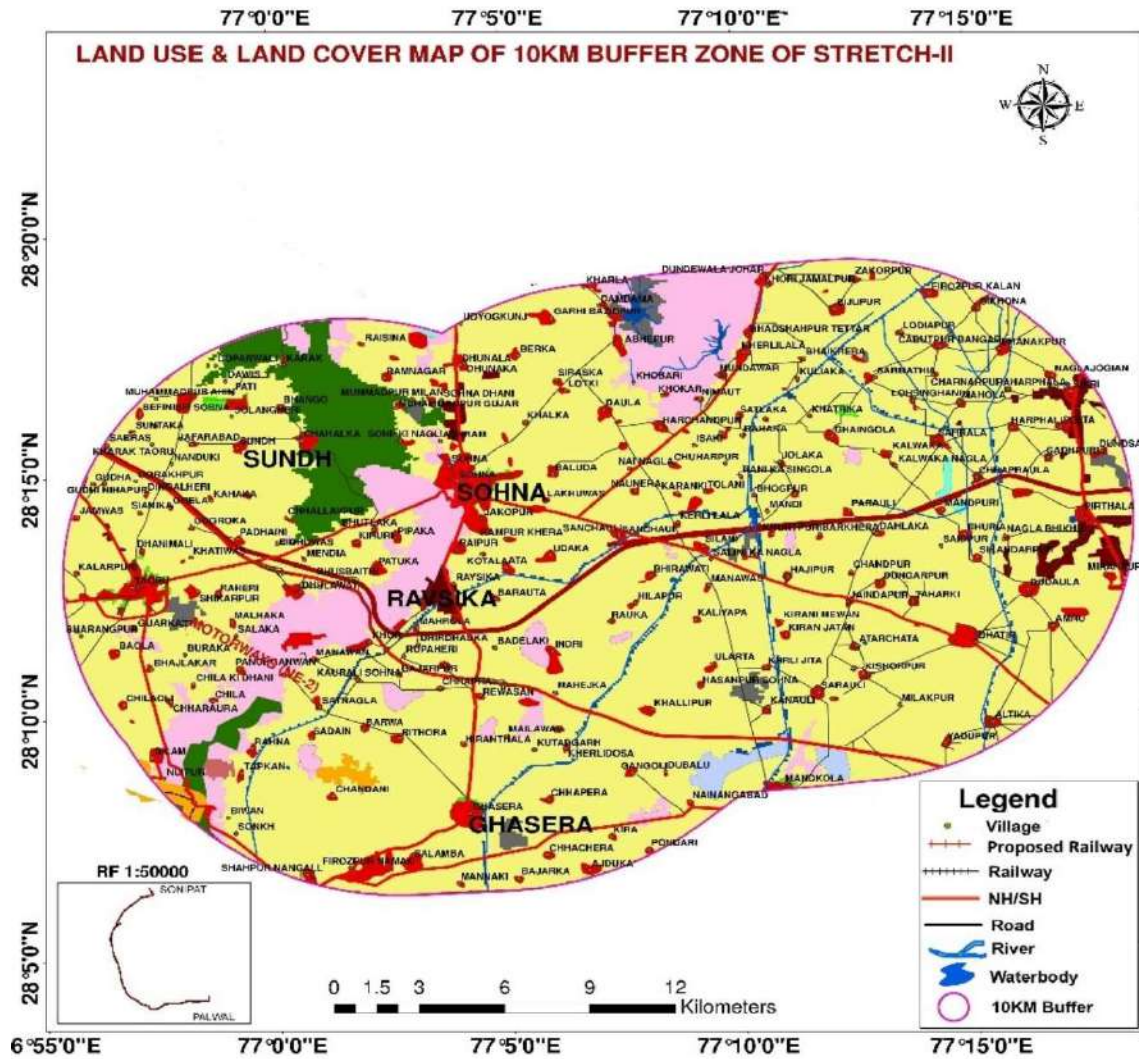
The land use and land cover of 10 km radius area around each station was observed through classification of each feature through satellite data and ground truth. It was observed that, the selection of each station was made based on the availability of land and land features. Most of the stations will be located on the agriculture land. It was observed that the surrounding area of station (10 km radial distance) covers agriculture area, habited area and barren land. The surrounding area is mostly used for agricultural purposes growing seasonal crops.

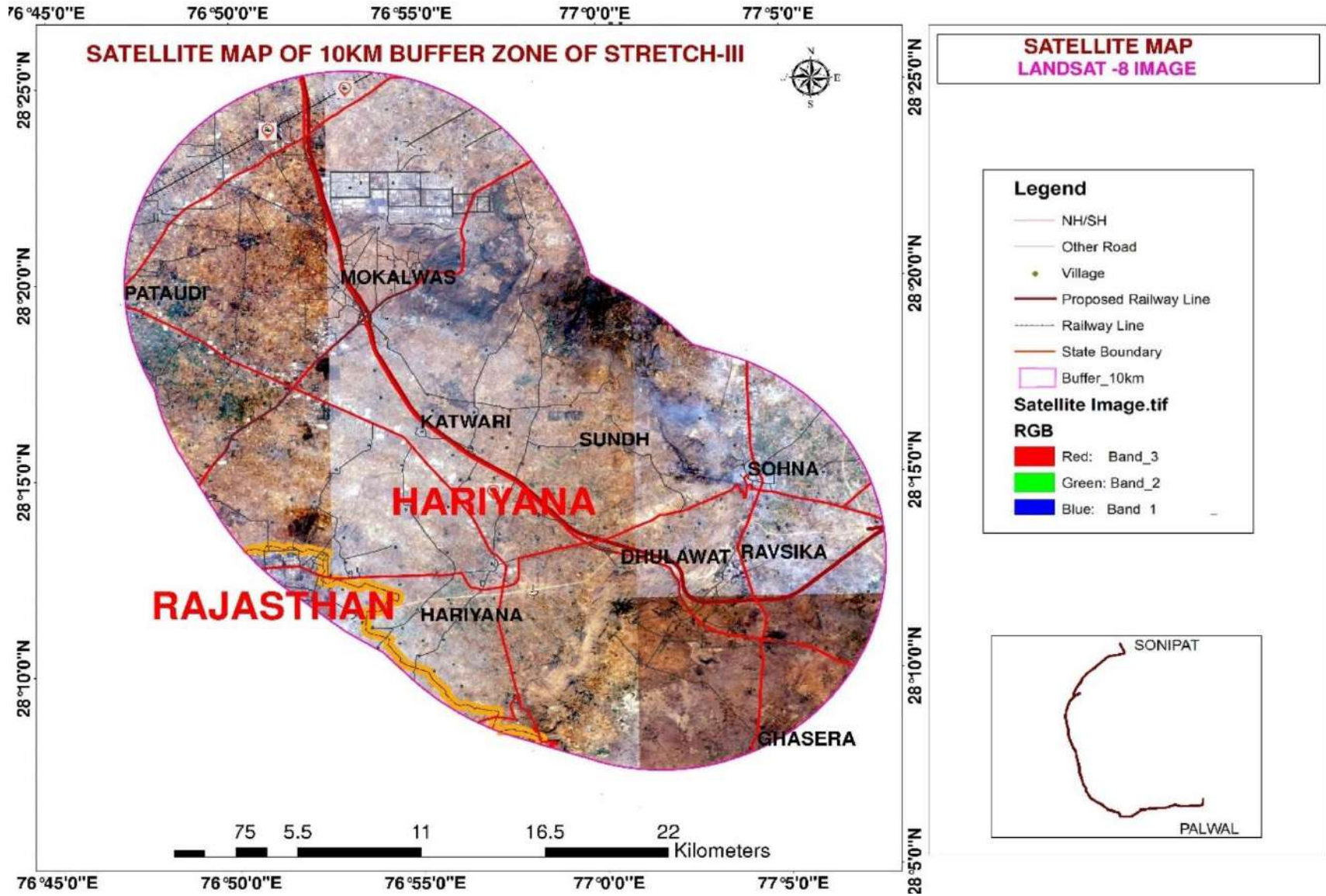
Land Use Studies of total 7 Stretch Lines of proposed Rail Route:- (10 km radius)

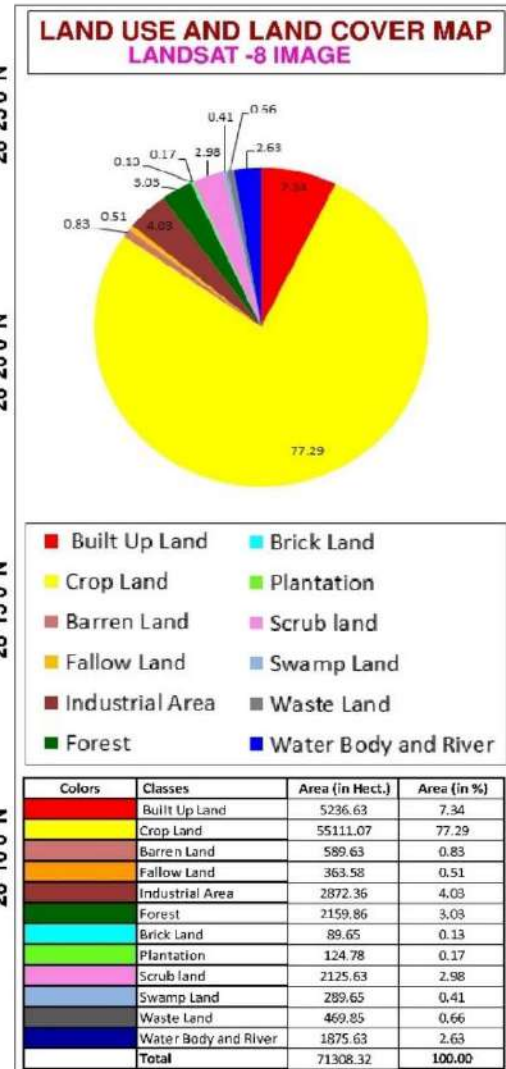
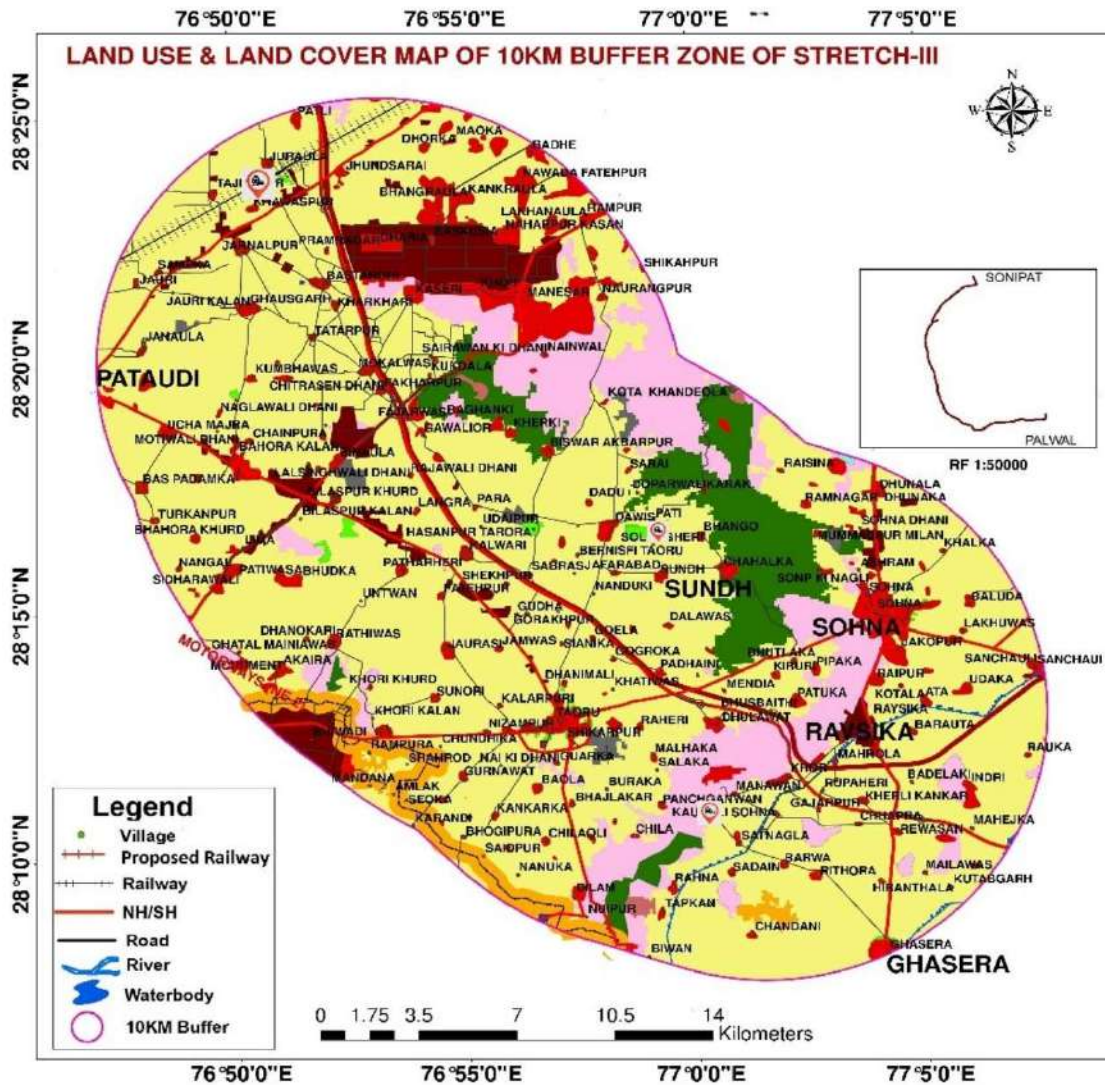




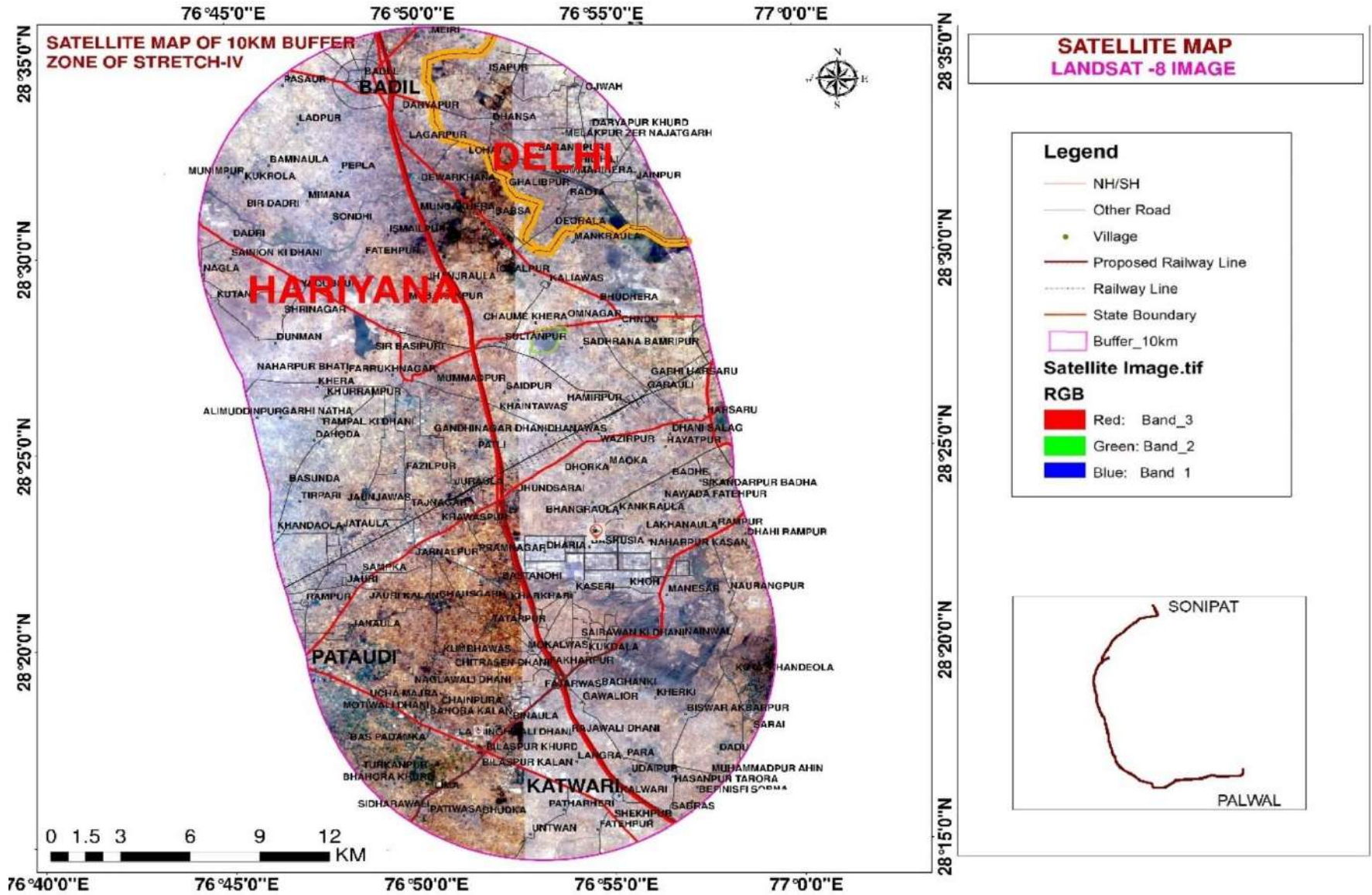


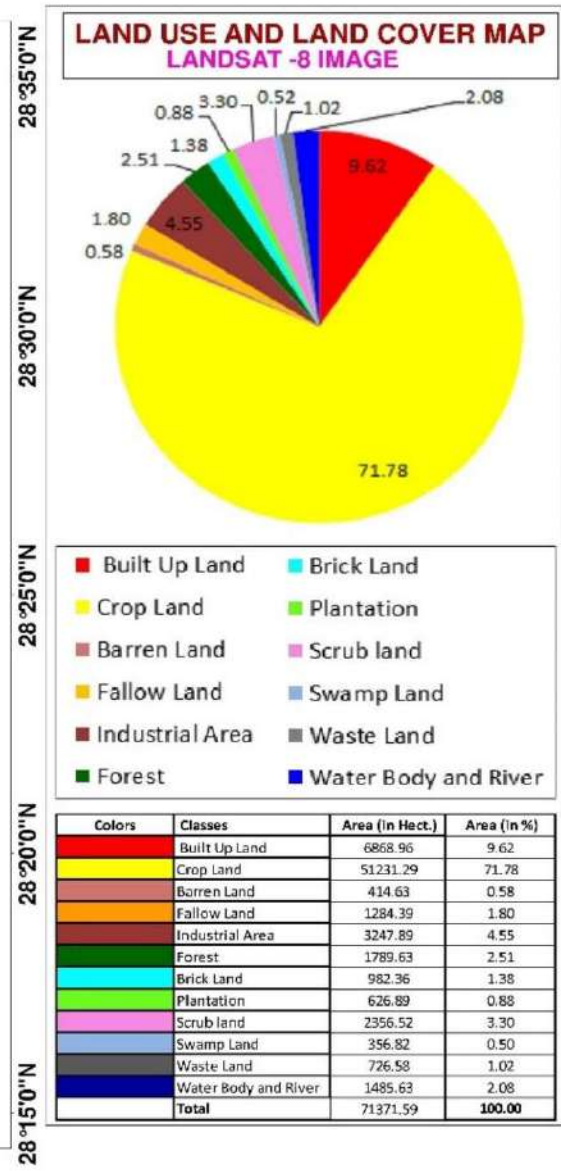
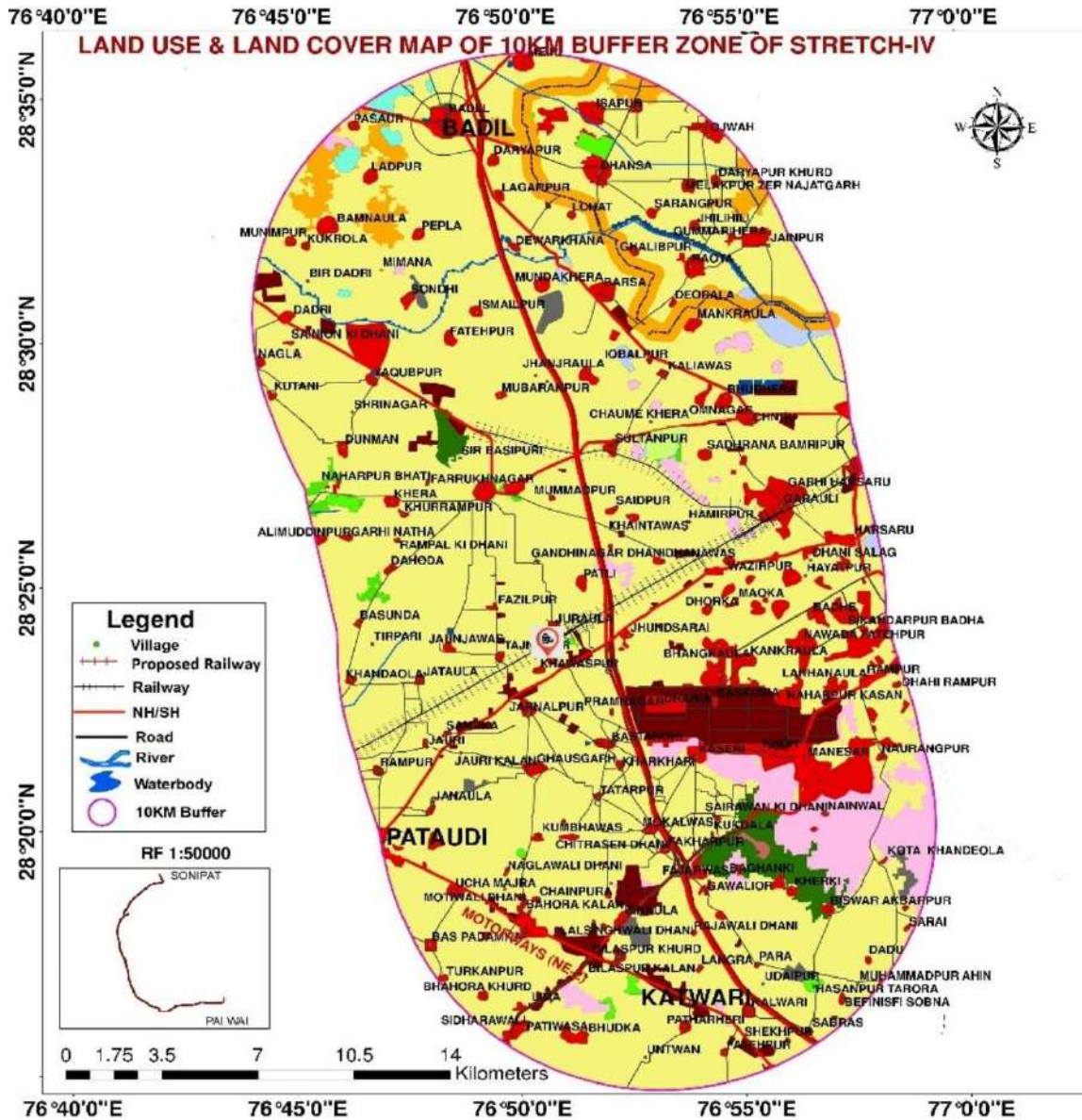




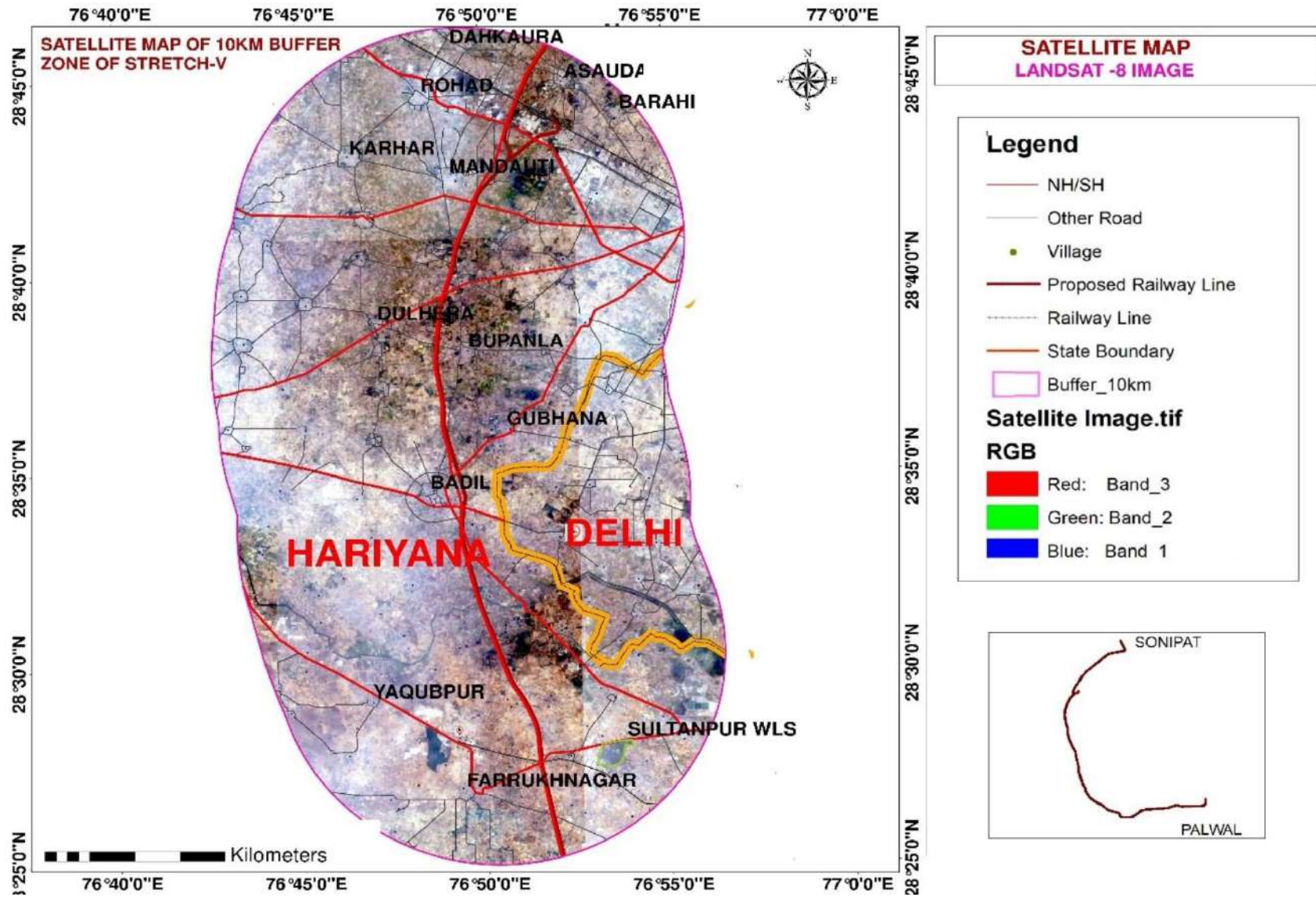


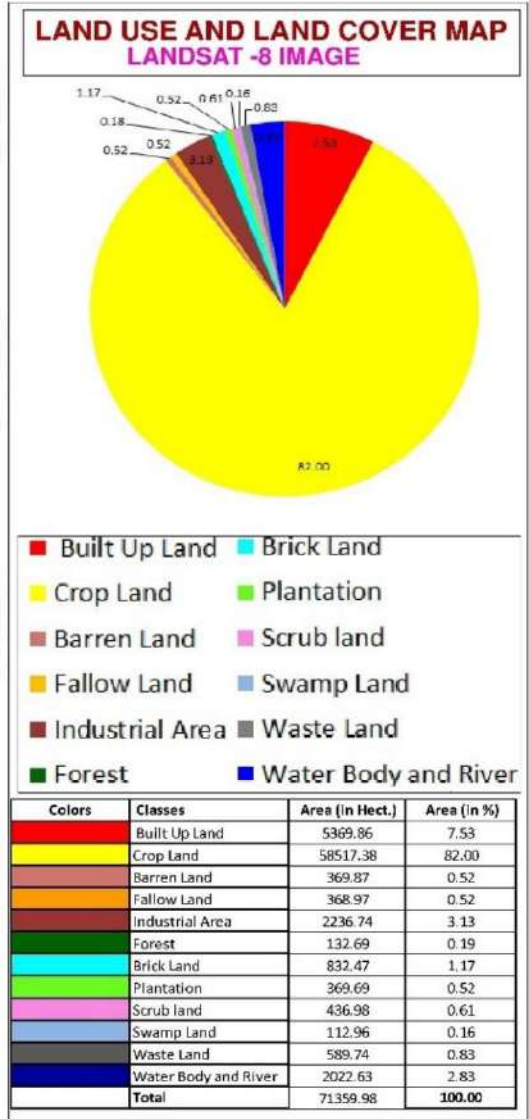
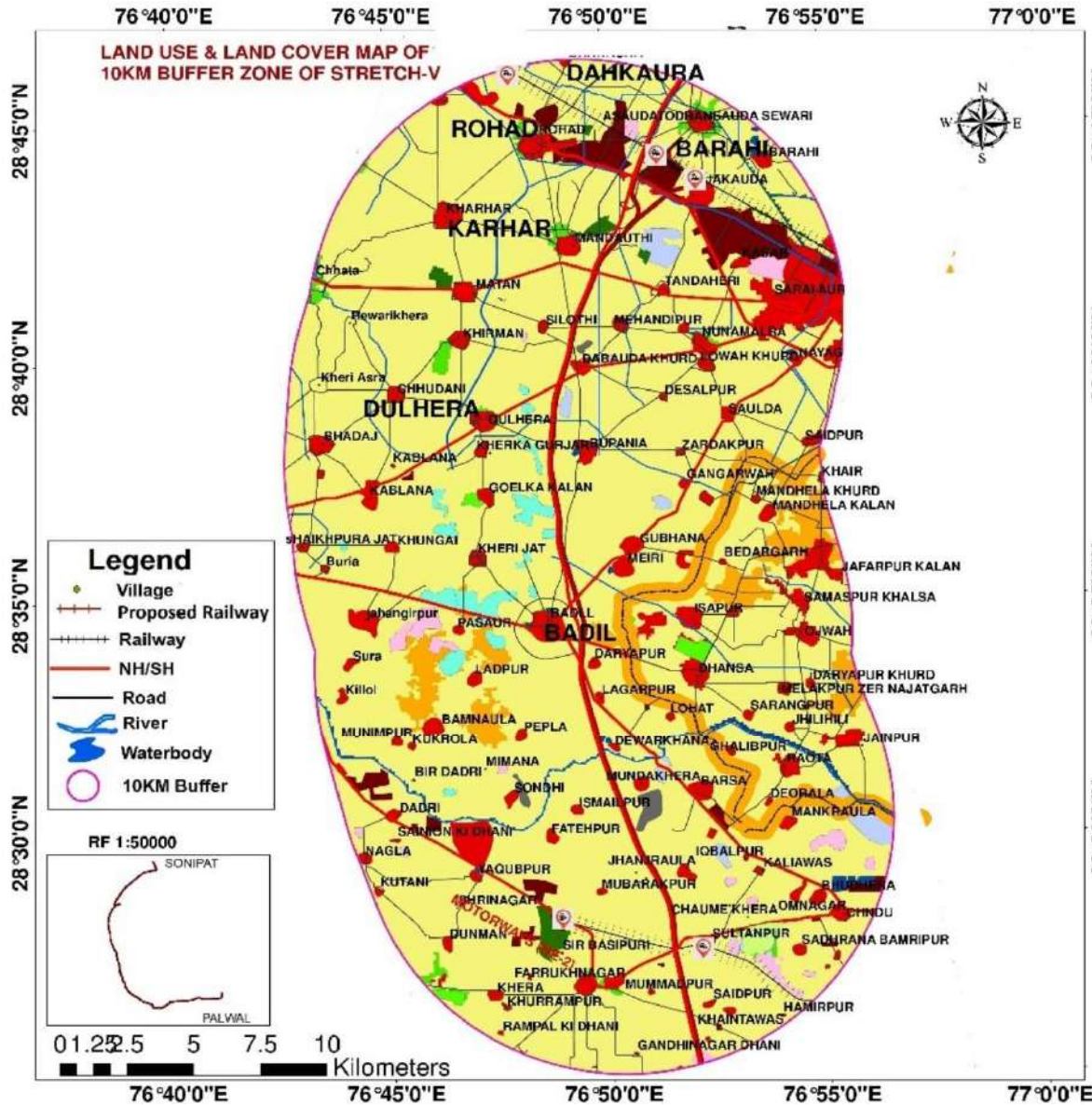
d) Land Use and Land Cover details for proposed Stretch-IV.



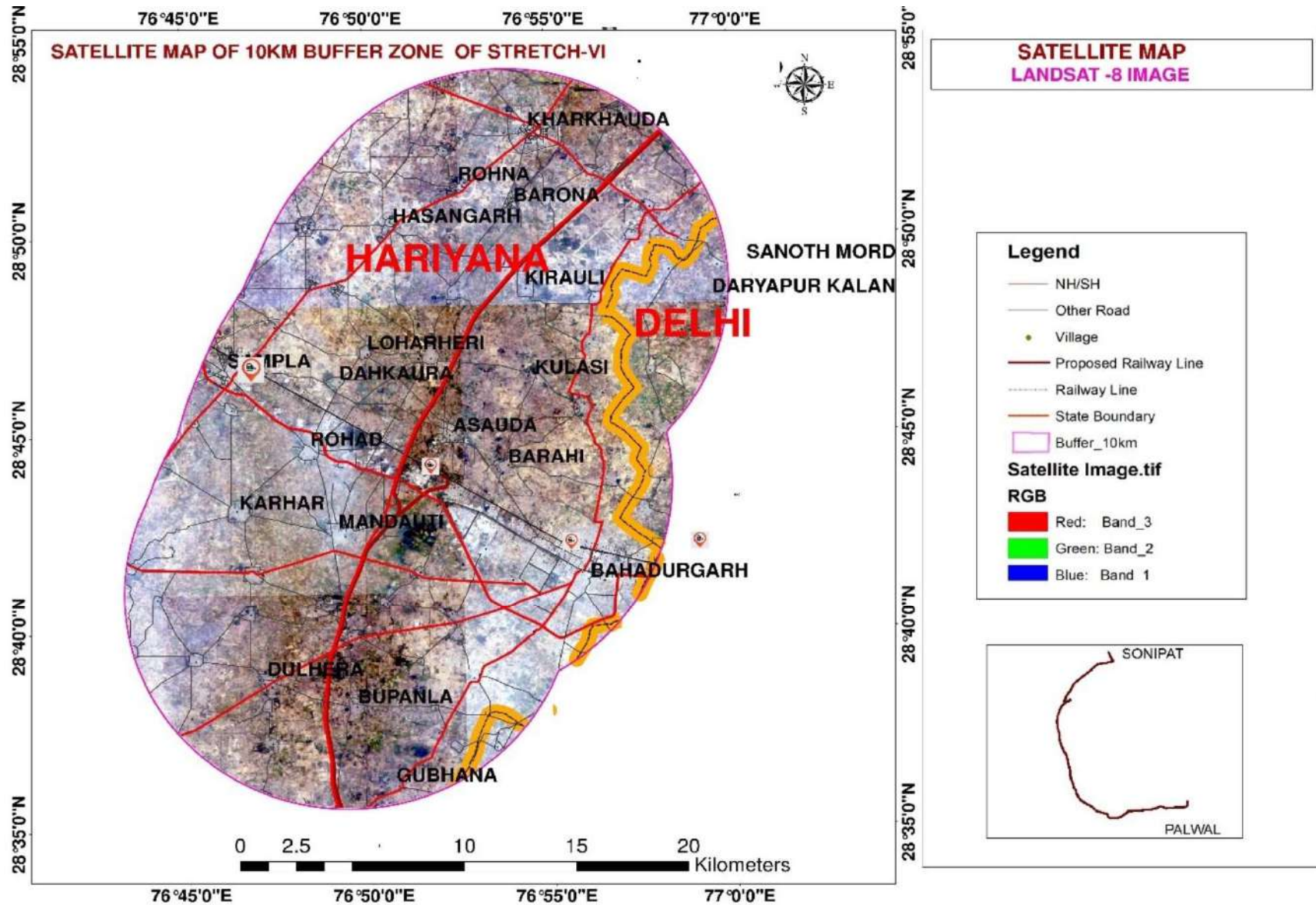


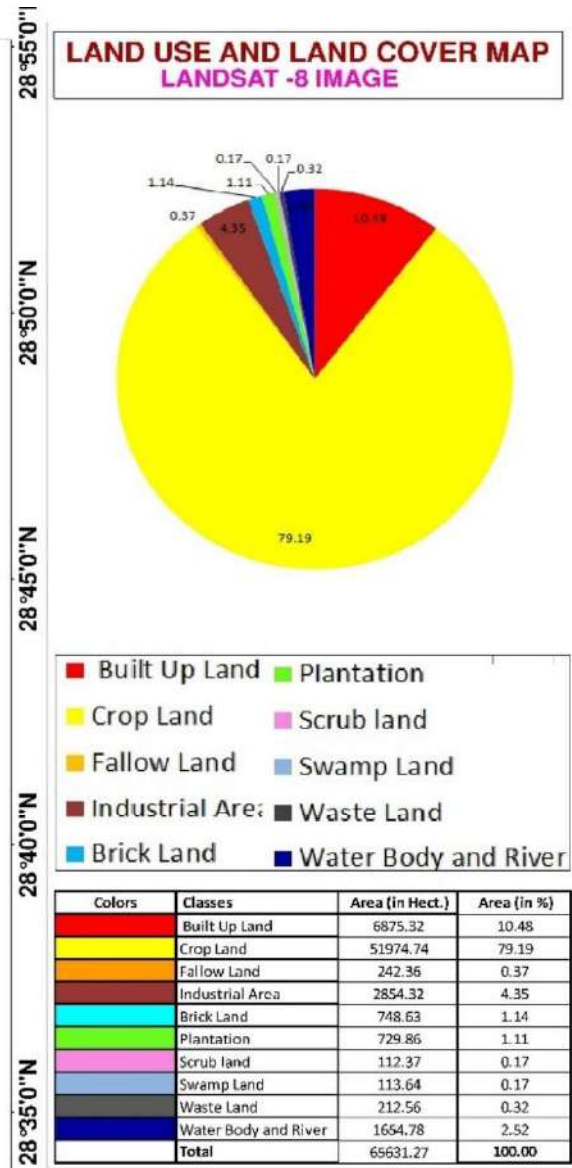
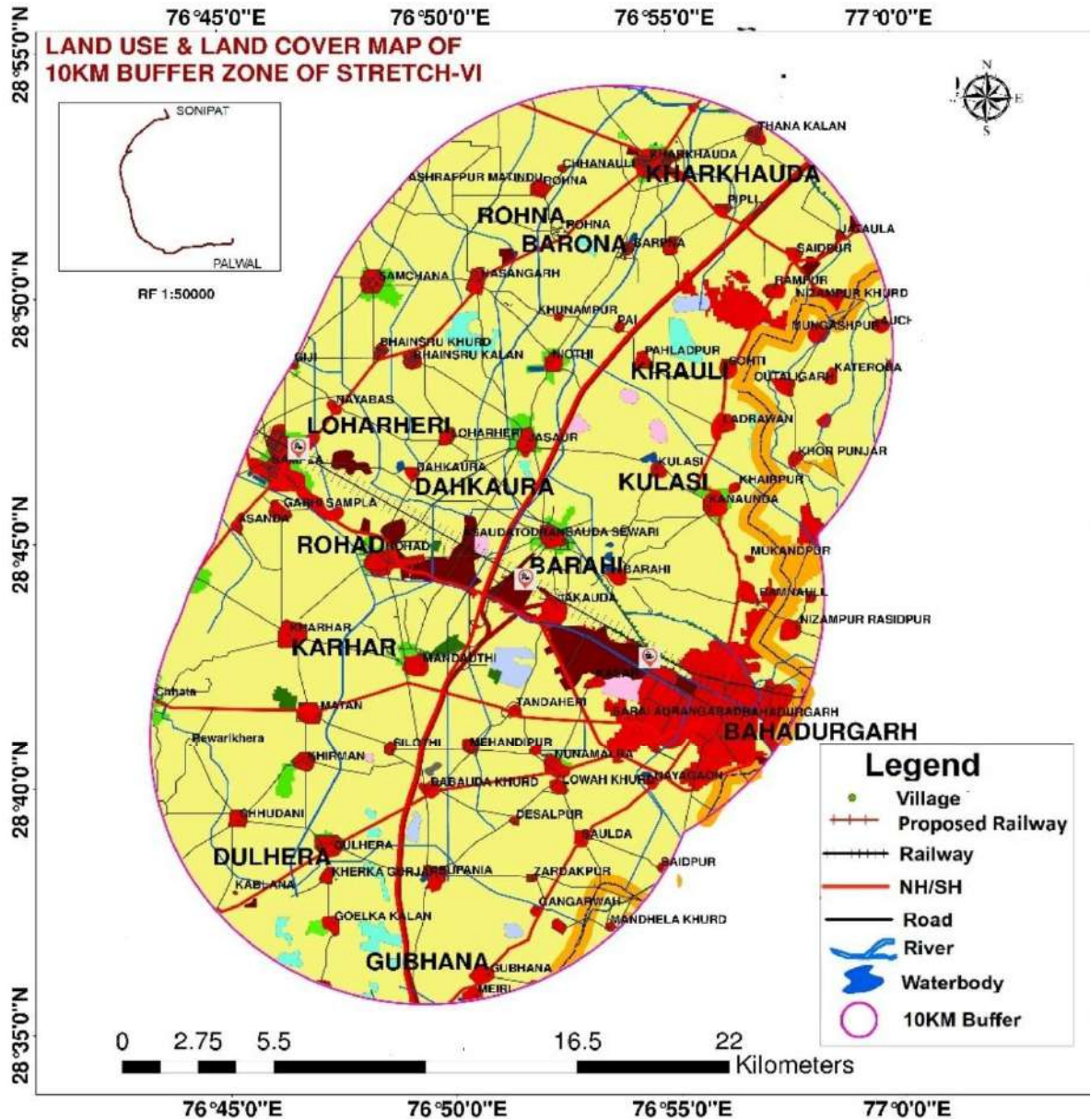
e) Land Use and Land Cover details for proposed Stretch-V.



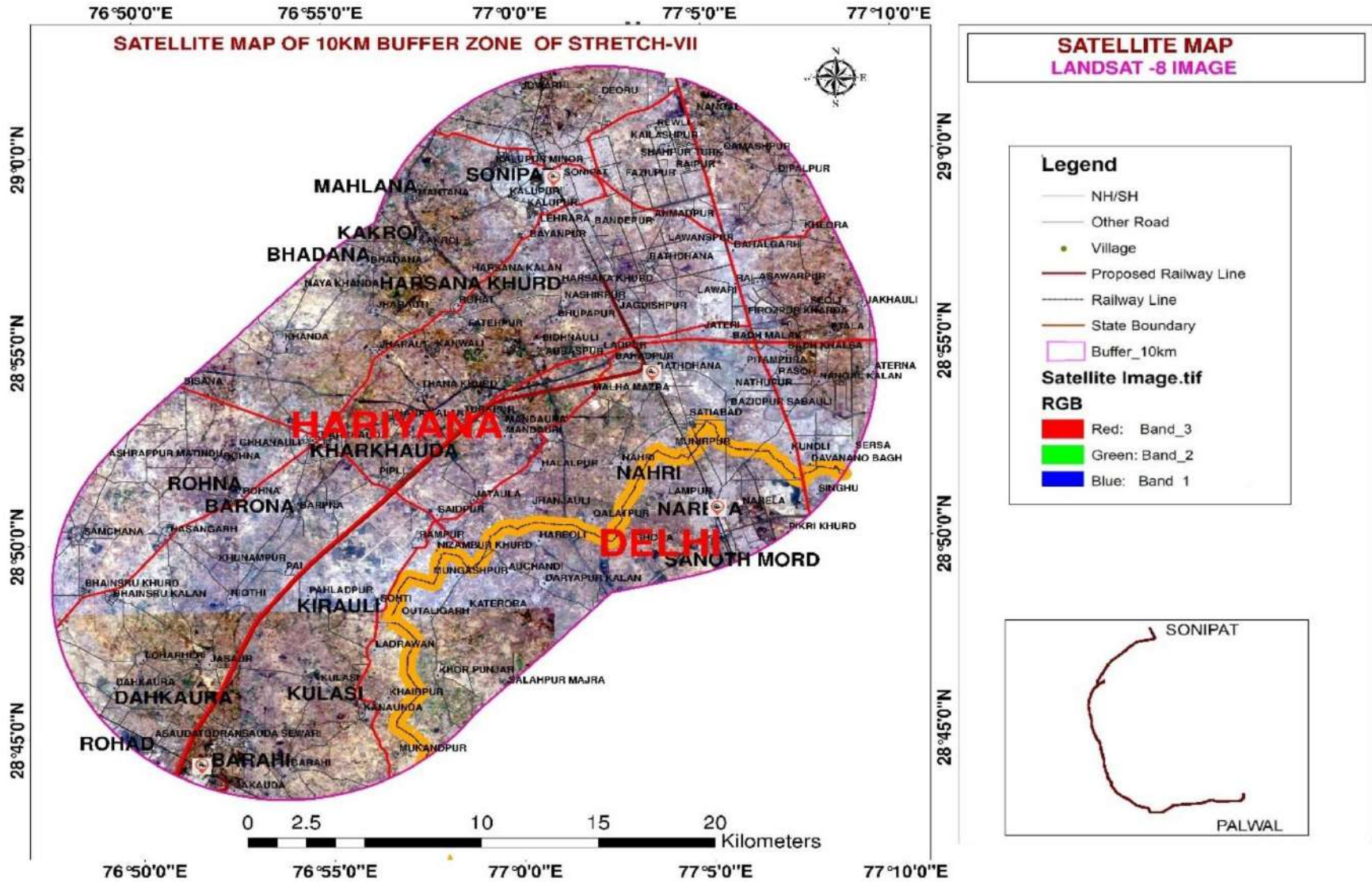


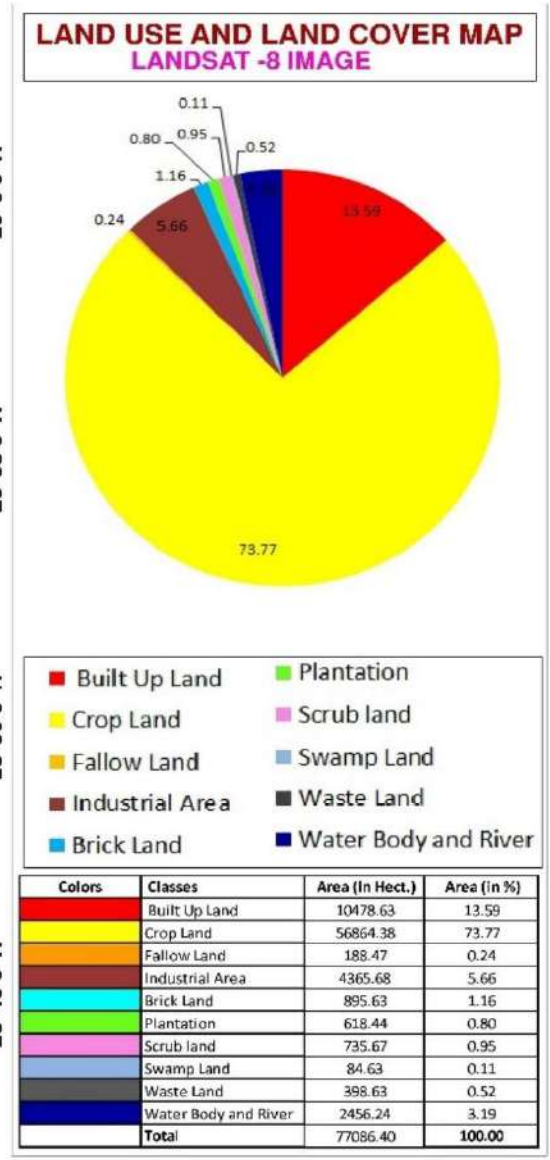
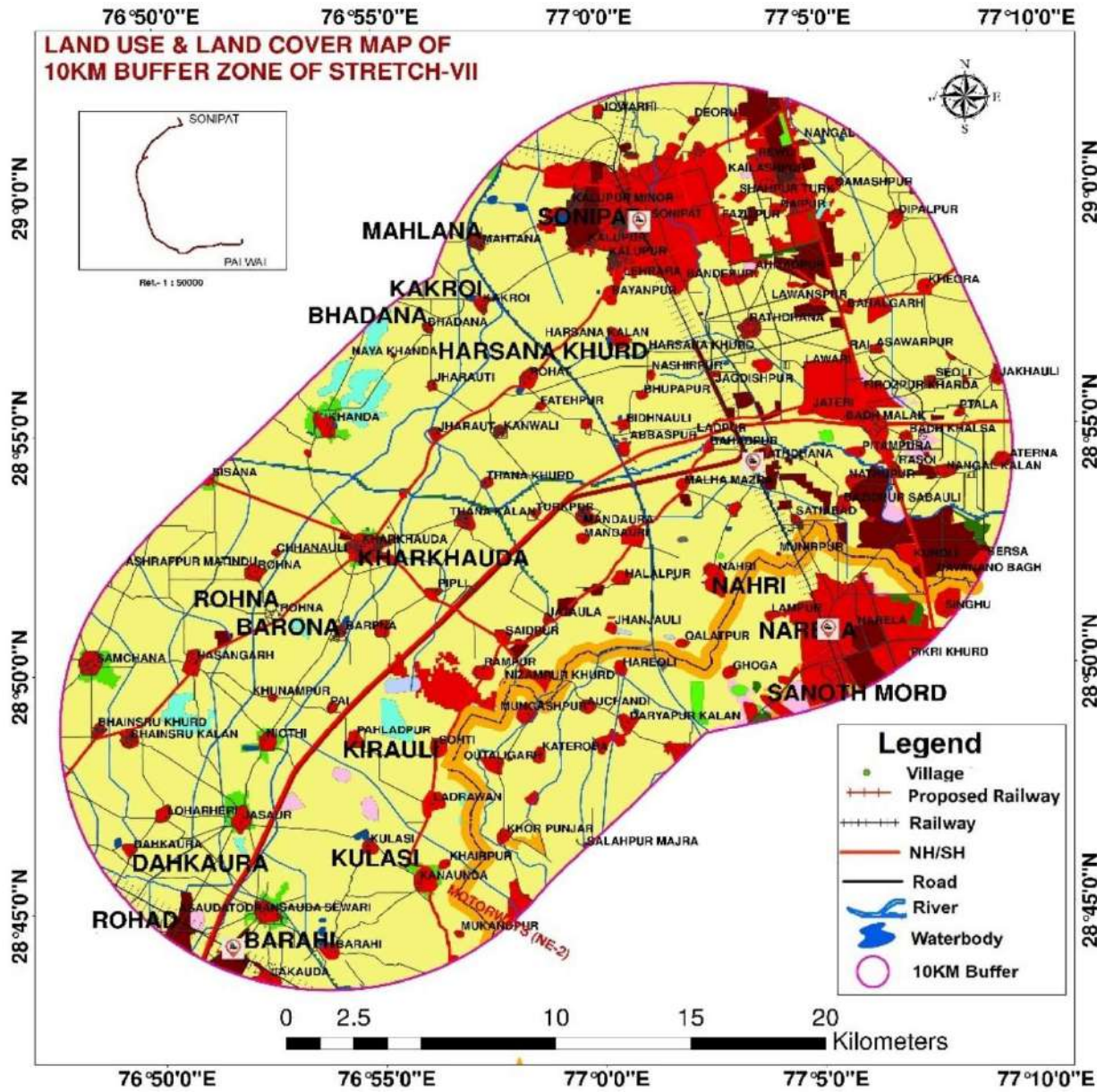
f) Land Use and Land Cover details for proposed Stretch-VI.





g) Land Use and Land Cover details for proposed Stretch-VII .





4.4.4 Summary of LU LC for Rail Route and Stations

For more detailed study of the land use & land cover pattern of the study area, the alignment is divided in 7 stretches (segments) each, covering 20 Km distance and a buffer zone of 10 Km on either side of each segment.

From the LULC map it can be reported that forest area is largest in Stretch III (58%) as compared to other stretches. Similarly, built up area is largest in stretch VII (27.61 %) & cultivated area in stretch V (26%) as compare to other stretches. A strip plan/map w.r.t right of way (RoW) for the proposed HORC project is given in **Annexure 4.3**.

4.5 WATER ENVIRONMENT

Water environment consists of water resources and its quality. Its study is important from the point of view to assess the sufficiency of water resources for needs of the project in its various stages and the impact of the project on water environment. In the proposed project area, surface and ground water quality have been tested to evaluate its suitability for the intended purpose. The photographs of water sampling sites is given in **Plate 4.2**. In order to assess the baseline water quality status of the study area, 6 Nos samples (3 samples from Surface water and 3 samples from ground water) were collected from the project area.

4.5.1 Ground Water Quality of the Project Area

A total of three sample locations were identified for ground water quality of the project area. The sample locations are shown in **Figure 4.15** and description of monitoring locations are given in **Table 4.18**. The samples were analyzed for physical and chemical characteristics for the purpose of domestic and irrigation use.

4.5.1.1 Methodology of Water Monitoring

The analytical methodology for water samples testing is given in **Table 4.17**.

Table 4.17: Water Testing Methodology

S. No.	Parameters	Test Method
1.	pH	APHA: 4500-H ⁺ B 23 nd Edition
2.	Conductivity	APHA: 2510 B. 23 nd Edition
3.	Turbidity	APHA: 2130-B Nephelometric Method 23 nd Edition
4.	Colour	APHA: 2120-b Visual Comparison Method 23 nd Edition
5.	COD	APHA: 5220 B 23 nd Edition
6.	Total Dissolved Solids	APHA: 2540 C 23 nd Edition
7.	Dissolved Oxygen (D.O)	APHA: 4500 O-C 23 nd Edition
8.	Alkalinity	APHA: 2320 B Alkalinity 23 nd Edition
9.	Chloride	APHA: 4500-Cl ⁻ B 23 nd Edition
10.	Sulphate	APHA: 4500-SO ⁴ E 23 nd Edition
11.	Fluoride	APHA: 4500-F ⁻ D 23 nd Edition
12.	Sodium	APHA: 3500-Na B 23 nd Edition
13.	Potassium	APHA: 3500-K B 23 nd Edition

S. No.	Parameters	Test Method
14.	Total Hardness	APHA: 2340 C 23 nd Edition
15.	Ca. Hardness	APHA: 3500-Ca B 23 nd Edition
16.	Calcium as Ca	APHA: 3500-Ca B 23 nd Edition
17.	Mg. Hardness	APHA: 3500-Mg B 23 nd Edition
18.	Magnesium as Mg	APHA: 3500 – Mg B 23 ^d Edition
19.	Amm. Nitrogen	IS 3025 (PP 34) 1988 (RA 2014)
20.	Nitrate	IS 3025 (Part 34) (3) 1988 (RA 2014)
21.	Phosphate	APHA: 4500-PC 23 nd Edition
22.	Cadmium	APHA: 3111 B 23 nd Edition
23.	Copper	APHA: 3111 B 23 nd Edition
24.	Iron	APHA: 3500 Fe-B 23 nd Edition
25.	Lead	APHA: 3111 B 23 nd Edition
26.	Manganese	APHA: 3111 B 23 nd Edition
27.	Zinc	APHA: 3111 B 23 nd Edition
28.	Total coliform	IS 1622

4.5.2 Groundwater Monitoring Locations

For analysis of ground water quality, 3 samples from hand pump were collected from the available water resources along proposed route and around the stations or cabins within 5 km radius. The details of groundwater sampling locations along the stretch are given in **Table 4.18**.

Table 4.18: Sampling Locations for Groundwater

S. No.	Area Description	Sample Code	Aerial distance from alignment (Km)	Latitude and longitude	Frequency
1.	Kharkhoda Town	GW1	4.15km	28°52'15.41" N 76°54'15.33" E	Once during the study period as grab sample
2.	Asoda Town	GW2	1.35km	28°44'53.58" N 76°52'04.37" E	
3.	Khedi Kankar	GW3	0.17km	28°10'55.31" N 77°03'45.28" E	

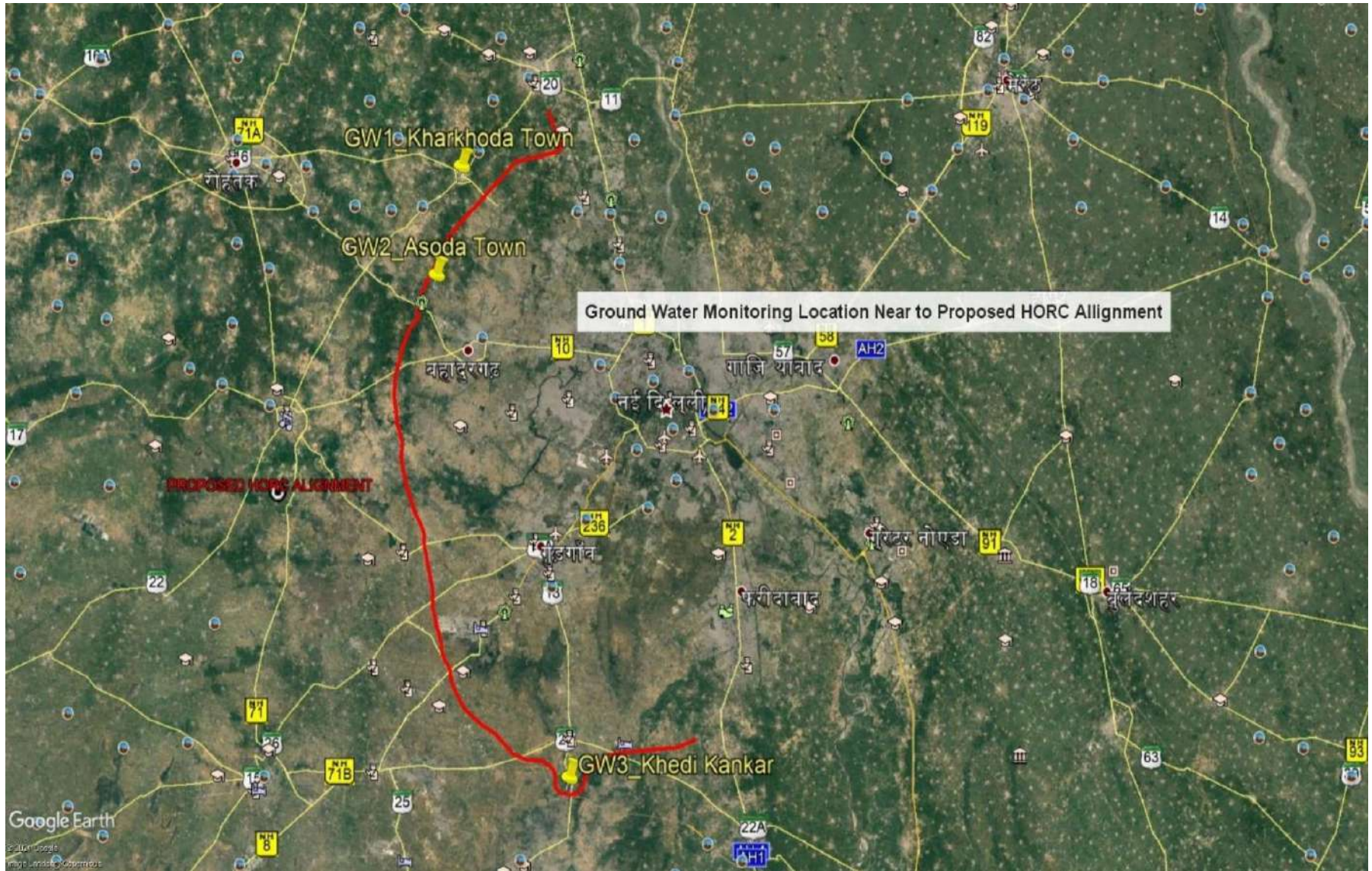


Figure 4.15: Ground Water Sampling Locations Near to Proposed HARC Alignment

4.5.2.1 Groundwater Monitoring Results

Groundwater samples was collected (during December 2020) from three locations and their quality was analysed as per CPCB guidelines. The results of the same are shown in **Table 4.19**.

Table 4.19: Groundwater Monitoring Results

S. No.	Parameter	Unit (SI)	Acceptable limits as per ISO: 10500:2012	Sample Code		
				GW1	GW2	GW3
1.	pH	-	6.5-8.5	7.88	7.82	7.78
2.	Conductivity	mS/m	--	262.0	280.0	220.0
3.	Turbidity	NTU		<1.0	<1.0	<1.0
4.	Colour	Pt-Co	5	<5.0	<5.0	<5.0
5.	COD	mg/l	--	-	-	-
6.	Total Dissolved Solids	mg/l	500	1560.0	1582.0	1350.0
7.	Dissolved Oxygen (D.O)	mg/l	--	-	-	-
8.	Alkalinity	mg/l	200	312.0	388.0	168.0
9.	Chloride	mg/l	250	348.0	242.8	342.0
10.	Sulphate	mg/l	200	142.0	192.4	148.0
11.	Fluoride	mg/l	1.0	0.88	0.96	0.98
12.	Sodium	mg/l	--	256.0	218.0	221.8
13.	Potassium	mg/l	--	112.9	98.42	112.6
14.	Total Hardness	mg/l	200	556.0	498.0	416.0
15.	Ca. Hardness	mg/l	--	366.0	296.0	272.0
16.	Calcium as Ca	mg/l	75	146.69	118.63	109.01
17.	Mg. Hardness	mg/l	--	190.0	202.0	144.0
18.	Magnesium as Mg	mg/l	30	46.28	49.02	35.07
19.	Amm. Nitrogen	mg/l	--	0.88	1.66	1.24
20.	Nitrate	mg/l	45	12.66	11.26	11.32
21.	Phosphate	mg/l	--	1.18	1.82	0.96
22.	Cadmium	mg/l	0.003	<0.1	<0.1	<0.1
23.	Copper	mg/l	0.05	<0.03	<0.03	<0.03
24.	Iron	mg/l	0.3	0.82	0.66	0.88
25.	Lead	mg/l	0.01	<0.15	<0.15	<0.15
26.	Manganese	mg/l	0.1	<0.03	<0.03	<0.03
27.	Zinc	mg/l	5	<0.06	<0.06	<0.06
28.	Total coliform	MPN/100 ml	-	Absent	Absent	Absent

GW1: Kharkhoda Town, GW2: Asoda Town and GW3: Khedi Kankar

4.5.2.2 Interpretation of the result

The analysis results indicate that the pH of the groundwater in the study area ranged from **7.78 to 7.88**. The TDS (Total Dissolved Solids) were found in the range of **1350 mg/L to 1582 mg/L**. Total Hardness was also found on the higher side (**416 – 556 mg/L**) compared to desired limit of **200 mg/L**. Alkalinity was found to be moderate indicating good buffering capacity. Fluoride content varied from **0.88 mg/L – 0.98 mg/L** which was found within permissible limit. Heavy metals were found to be within permissible limits in the ground water except iron content in some locations. It is seen that the physico-chemical characteristics of groundwater is mineralized to some extent in the form of chloride, calcium, magnesium, nitrate and fluoride and found within the desirable limit. The detailed lab report is given in **Annexure 4.4**.

The ground water is not found suitable for the drinking purposes. Therefore, groundwater should not be used for the drinking purpose of the construction workers.

4.5.3 Surface Water Monitoring Locations

Surface water samples were collected (during December 2020) from three locations and their quality was analysed as per CPCB guidelines. The locations of surface water samples is shown in **Figure 4.16**.

Table 4.20: Surface Water Monitoring Locations

S. No.	Area Description	Sample Code	Aerial distance from alignment (Km)	Latitude and longitude	Frequency
1.	Near village- Rohat (Canal water)	SW1	5.30km	28°56'33.58" N 76°58'58.37" E	Once during the study period as grab sample
2.	Mandothi Village (Canal water)	SW2	3.60km	28°41'39.28" N 76°47'28.54"E	
3.	Near village Chapraula (Canal water)	SW3	0.80km	28°14'37.54" N 77°15'36.01" E	

4.5.3.1 Surface Water Monitoring Results

The results of surface water monitoring are given in **Table 4.21**.

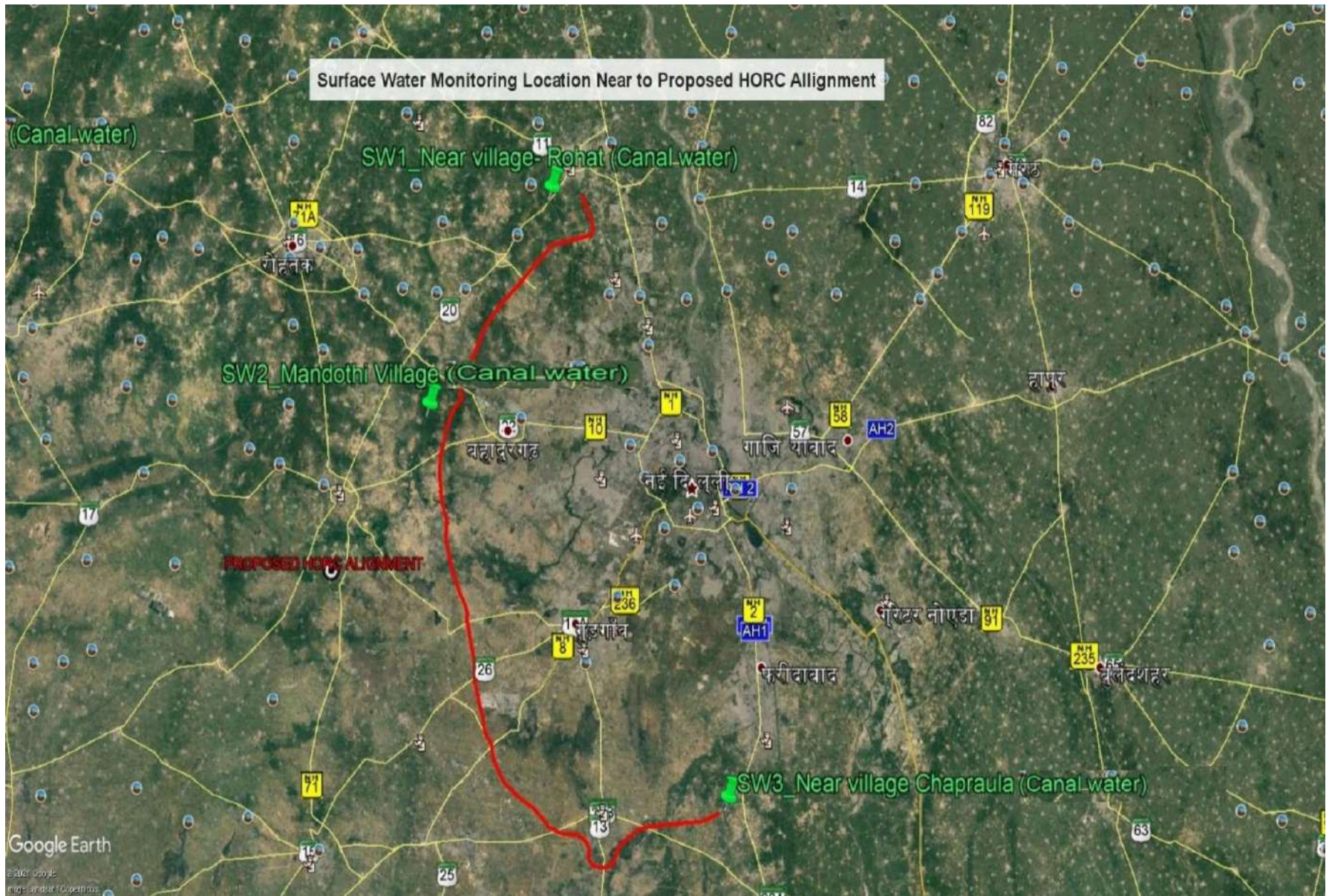


Figure 4.16: Surface Water Sampling Locations Near to Proposed HARC Alignment

Table 4.21: Surface Water Monitoring Results

S. No.	Parameter	Unit (SI)	Acceptable limit as per ISO: 10500:2012	Sample Code		
				SW1	SW2	SW3
1.	pH	-	6.5-8.5	7.62	7.72	7.68
2.	Conductivity	mS/m	--	240.0	290.0	420.0
3.	Turbidity	NTU		<1.0	<1.0	<1.0
4.	Colour	Pt-Co	5	<5.0	<5.0	<5.0
5.	COD	mg/l	--	82.34	76.54	70.24
6.	Total Dissolved Solids	mg/l	500	1420.0	1620.0	1390.0
7.	Dissolved Oxygen (D.O)	mg/l	--	21.36	20.34	18.24
8.	Alkalinity	mg/l	200	198.0	198.0	194.0
9.	Chloride	mg/l	250	356.0	456.0	342.0
10.	Sulphate	mg/l	200	228.4	384.0	232.0
11.	Fluoride	mg/l	1.0	1.26	0.98	1.24
12.	Sodium	mg/l	--	322.6	322.6	346.0
13.	Potassium	mg/l	--	119.66	156.0	102.0
14.	Total Hardness	mg/l	200	510.0	710.0	662.0
15.	Ca. Hardness	mg/l	--	376.0	476.0	488.0
16.	Calcium as Ca	mg/l	75	150.0	190.78	195.59
17.	Mg. Hardness	mg/l	--	134.0	234.0	174.0
18.	Magnesium as Mg	mg/l	30	32.64	57.00	42.38
19.	Amm. Nitrogen	mg/l	--	126	1.68	1.78
20.	Nitrate	mg/l	45	0.94	9.82	10.34
21.	Phosphate	mg/l	--	1.12	1.16	1.42
22.	Cadmium	mg/l	0.003	<0.1	<0.1	<0.1
23.	Copper	mg/l	0.05	<0.03	<0.03	<0.03
24.	Iron	mg/l	0.3	0.66	0.86	0.56
25.	Lead	mg/l	0.01	<0.15	<0.15	<0.15
26.	Manganese	mg/l	0.1	<0.03	<0.03	<0.03
27.	Zinc	mg/l	5	<0.06	<0.06	<0.06
28.	Total coliform	MPN/100 ml	-	Absent	Absent	Absent

SW1: Near village- Rohat, SW 2: Mandothi Village and SW3: Near village Chapraula

4.5.3.2 Interpretation of the Result

Surface water samples were collected, analyzed and compared with Indian standard for drinking water (IS:10500:2012). TDS was found to be **1390 – 1620 mg/l** which is above permissible limit of 500 mg/l, pH values were found to be in the range of **7.62 to 7.72** which indicates that water is having good buffering capacity (alkalinity in the range of **194- 198 mg/l**). It is seen that the results of physico-chemical analysis of other parameters like chloride, calcium, magnesium, nitrate and fluoride were within the desirable limit. Overall surface water quality was found to be highly mineralized with report to dissolved solids with high content of sulphate and magnesium indicating health impact on children.

4.6 AMBIENT AIR ENVIRONMENT

The ambient air environment is responsible for the health of human beings, animals, wildlife and vegetation. All air pollutants emitted by point and non-point sources are transported, dispersed or concentrated by meteorological and topographical conditions. The meteorological parameters regulate the transport and diffusion of pollutants into the atmosphere. In order to assess the impact on existing ambient environment due to the project, it is necessary to have baseline status of ambient environmental parameters. Meteorological data on rainfall, wind, humidity, and temperature was collected from secondary sources. The ambient air environmental status existing in the project area is discussed in different paragraphs as under. The photograph of air sampling sites is given in **Plate 4.3 to 4.5**.

4.6.1 Air Quality

The prime objective of baseline air quality survey was to assess the air quality of the area; it would also be useful in assessing the conformity to standards of the ambient air quality. The sources of air pollution during the construction phase would be due to the site clearance & preparation activities, material handling activities, emissions from construction equipment & vehicular movement, and operation of diesel generators.

Air quality monitoring was carried out at 10 locations along the project alignment twice a week for 3 months of study period (December 2020 to February 2021). Five major air pollutants viz. particulate matter (PM₁₀ & PM_{2.5}), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO_x) and CO representing the air quality was monitored. The sample locations are shown in **Figure 4.17** and description of Air quality monitoring locations are given in **Table 4.22**. The results are shown in **Table 4.23**. The methodology for testing was as under:-

- The sampling was done continuously for 24 hours for SO₂, NO_x, PM₁₀, PM_{2.5} & CO with a frequency of twice a week for December 2020, January and February 2021 months;
- Sampling stations selected were above three meters from ground level;
- The sampling stations selected were representative of the area for which monitoring was done;
- There was no obstruction in the wind flow direction (away from tall building and trees);
- For traffic, the monitoring locations were kept 3 m above the street level in village roads;
- Equipment, reagents, filter paper and other accessories were as per NABL standards;
- During monitoring cross checking was ensured;
- Samples were collected stored and transported to laboratory for analysis as per standard method.

Table 4.22: Sampling Locations for Ambient Air Quality

S. No	Location Code	Name of Stations	Aerial distance from alignment	Geo-Coordinate		Remark
1	AAQM 1	Harsana Kala	3.80km	28°56'43.36"N	77°00'31.85"E	Low populated area
2	AAQM 2	Kharkhoda Town	3.92km	28°52'13.11"N	76°54'18.41"E	Highly Populated Area
3	AAQM 3	Asoda Town	1.30km	28°44'52.87"N	76°52'04.55"E	Highly Populated Area
4	AAQM 4	Mandothi Village	1.80km	28°42'29.04"N	76°48'54.99"E	Low populated area
5	AAQM 5	Farukh Nagar Town	3.35km	28°27'0.61"N	76°49'29.77"E	Highly Populated Area
6	AAQM 6	Near Sultanpur village	0.75km	28°27'49.08"N	76°51'53.25"E	Moderately Populated Area
7	AAQM 7	Manesar Town	5.45km	28°21'09.14"N	76°56'14.54"E	Highly Populated Area & Industrial area
8	AAQM 8	Fazalwas Village	0.50km	28°18'47.53"N	76°54'03.14"E	Moderately Populated Area
9	AAQM 9	Khedi Kankar Village near Sohna	0.35km	28°11'02.10"N	77°03'40.71"E	Low populated area
10	AAQM 10	New Parthala Rly station	2.85km	28°14'29.11"N	77°16'53.2"E	Railway Yard

Table 4.23: Ambient Air Quality Monitoring Results Along the Route

Limits as Per CPCB Guidelines		100 (24 hrs)	60 (24 hrs)	80 (24 hrs)	80 (24 hrs)	04/ hr	
Limits as Per IFC Guidelines		50 (24 hrs)	25 (24 hrs)	200 (1 hour)	20 (24 hrs)	-	
S. No.	Station Code	Range	Parameter and Results				
			PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	NO _x (µg/m ³)	SO ₂ (µg/m ³)	CO (mg/m ³)
Harsana Kalan							
1	AAQM 1	Minimum	68.82	48.56	14.28	6.24	1.2
		Maximum	78.48	58.64	18.4	7.64	2.2
Kharkhoda Town							
2	AAQM 2	Minimum	72.56	50.18	9.52	6.92	1.4
		Maximum	82.94	62.34	12.34	8.66	2.8
Asoda Town							
3	AAQM 3	Minimum	82.34	50.64	12.24	6.24	1.4
		Maximum	88.48	56.82	15.82	7.26	2.8
Mandothi							
4	AAQM 4	Minimum	68.56	42.34	12.24	6.24	1.2
		Maximum	74.56	48.12	14.58	7.46	2.2
Near Sultanpur village							
5	AAQM 5	Minimum	83.24	50.62	10.16	4.22	2.2
		Maximum	88.72	55.64	12.34	6.42	2.9
Farukh Nagar Town							
6	AAQM 6	Minimum	182.34	82.12	40.26	24.34	2.2

Limits as Per CPCB Guidelines		100 (24 hrs)	60 (24 hrs)	80 (24 hrs)	80 (24 hrs)	04/ hr	
Limits as Per IFC Guidelines		50 (24 hrs)	25 (24 hrs)	200 (1 hour)	20 (24 hrs)	-	
S. No.	Station Code	Range	Parameter and Results				
			PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	NO _x (µg/m ³)	SO ₂ (µg/m ³)	CO (mg/m ³)
		Maximum	199.84	98.26	46.34	28.54	3.6
			Manesar Town				
7	AAQM 7	Minimum	86.34	54.24	12.2	5.62	1.8
		Maximum	98.34	58.62	15.26	8.16	2.8
			Fazalwas Village				
8	AAQM 8	Minimum	72.34	44.62	9.82	3.24	1.4
		Maximum	78.62	52.34	13.24	6.82	2.4
			Khedi Kankar Village near Sohna				
9	AAQM 9	Minimum	80.26	22.34	12.34	7.16	1.2
		Maximum	88.36	27.88	18.62	8.62	2.2
			New Parthala Rly station				
10	AAQM 10	Minimum	80.26	50.48	34.28	5.42	1.6
		Maximum	84.34	55.97	37.94	7.84	2.8

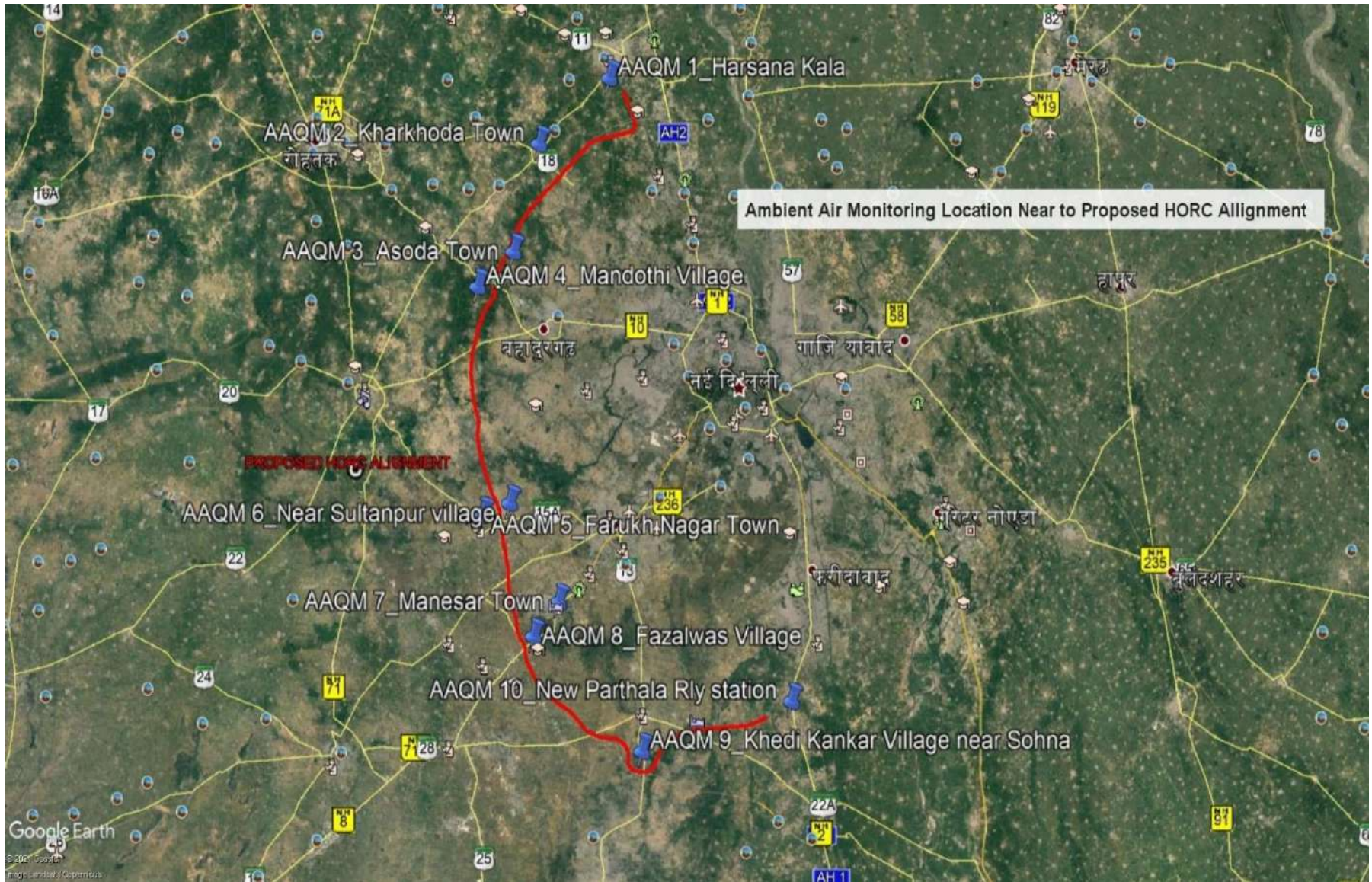


Figure 4.17: Sampling Locations for Ambient Air Quality w.r.t HARC Alignment

Observation and Interpretation results along the rail alignment

PM₁₀ concentration ranged from **68.56 – 199.84** µg/m³ in the study area. The maximum concentration was recorded at Farukh Nagar Town (where PM₁₀ and PM_{2.5} exceeds CPCB limits) and minimum concentration at Mandothi Village for PM₁₀ & at Khedi Kankar Village for PM_{2.5}. The high concentration might be due to the vehicular traffic in the area. SO₂ concentration ranged from **3.24 – 28.54** µg/m³. The maximum concentration **28.54** µg/m³ was recorded at Farukh Nagar Town and minimum concentration **3.24** µg/m³ was recorded at Fazalwas Village. NOx concentration ranged from **9.52 – 46.34** µg/m³ in the study area. The maximum concentration **46.34** µg/m³ was recorded at Farukh Nagar Town and minimum concentration of **9.52** µg/m³ was recorded at Kharkhoda Town. Similarly maximum concentration for CO was recorded as **3.6** mg/m³ at Farukhnagar Town and minimum was recorded as **1.2** mg/m³ at Khedli kankar Village.

The overall concentration levels of all the parameters monitored for air quality was found to be exceeded the AAQS specified by CPCB and IFC only at one location i.e., at **Farukh Nagar Town** remaining all location are under the prescribed limit. The detailed lab report is given in **Annexure 4.4**.

4.7 NOISE ENVIRONMENT

Noise beyond tolerance limit can lead to affects such as noise induced hearing loss and annoyance depending upon the loudness of noise levels. The environmental impacts of noise from the proposed construction activity and traffic movement are required to be assessed on factors like potential damage to hearings, psychological responses and annoyances. Noise is of concern during construction and operation phase of the project. The impacts of noise sources on surrounding community depend upon:

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one, which is continuously varying in loudness;
- Time of day at which noise occurs, for example high noise levels at night in residential areas are not acceptable because of sleep disturbance.

Various Noise Standards are given in Table below:-

Category of Zones	National Ambient Noise Standards, GoI		Noise Standards by IFC		Noise Standards by WHO	
	Leq in dB(A)		One Hour LAeq (dBA)		LAeq [dB(A)]	LAmx fast [dB]
	Day Time 6:00 AM to 10:00 PM	Night Time 10:00 PM to 6: AM	Day Time 7:00 AM to 10: PM	Night Time 10:00 PM to 7:00AM		
Industrial	75	70	70	70	70 (For 24 Hrs)	110 (For 24 Hrs)
Commercial	65	55				
Residential	55	45	55	45	55 (For 16 Hrs)	-
Silence Zone * Institutional, educational	50	40			30 (For 8 Hrs)	40 (For 16 Hrs)

4.7.1 Noise Monitoring Locations

The hourly Leq noise levels were recorded at 10 locations along the alignment covering stations/junctions including the existing junction. Details of the sampling locations are given in **Table 4.24** and shown in **Figure 4.18**.

Table 4.24: Sampling Locations for Noise Quality

S. No	Station Code	Name of Stations	Aerial distance from alignment (Km)	Geo-Coordinate		Remark
1	NQ 1	Harsana Kala	3.80km	28°56'43.36"N	77°00'31.85"E	Low populated area
2	NQ 2	Kharkoda Town	3.92km	28°52'13.11"N	76°54'18.41"E	Highly Populated Area
3	NQ 3	Asoda Town	1.30km	28°44'52.87"N	76°52'04.55"E	Highly Populated Area
4	NQ 4	Mandothi Village	1.80km	28°42'29.04"N	76°48'54.99"E	Low populated area
5	NQ 5	Near Sultanpur village	0.75km	28°27'49.08"N	76°51'53.25"E	Moderately Populated Area
6	NQ 6	Farukh Nagar Town	3.35km	28°27'0.61"N	76°49'29.77"E	Highly Populated Area
7	NQ 7	Manesar Town	5.45km	28°21'09.14"N	76°56'14.54"E	Highly Populated Area & Industrial area
8	NQ 8	Fazalwas Village	0.50km	28°18'47.53"N	76°54'03.14"E	Moderately Populated Area
9	NQ 9	Khedi Kankar Village near Sohna	0.35km	28°11'02.10"N	77°03'40.71"E	Low populated area
10	NQ 10	New Pirthala Rly station	2.85km	28°14'29.11"N	77°16'53.2"E	Railway Yard

4.7.2 Results of Ambient Noise Monitoring

Results of ambient noise monitoring are given in **Table 4.25**. The detailed lab report and hourly noise data is given in **Annexure 4.4** and **Annexure 4.5** respectively.

Table 4.25: Ambient Noise Monitoring Results

Station Code	Name of the location (Along the rail route)	Area Category based on population density	CPCB Limit		Noise levels dB(A)	
			Leq day	Leq night	Leq day (6 AM To 6 PM)	Leq night (6 PM To 6 AM)
NQ1	Harsana Kala	Low populated area	55	45	65.62	43.50
NQ2	Kharkoda Town	Highly Populated Area	55	45	64.87	43.84
NQ3	Asoda Town	Highly Populated Area	55	45	67.44	44.80
NQ4	Mandothi Village	Low populated area	55	45	67.13	41.88
NQ5	Near Sultanpur village	Moderately Populated Area	55	45	63.72	43.80
NQ6	Farukh Nagar Town	Highly Populated Area	55	45	65.60	43.22
NQ7	Manesar Town	Highly Populated Area Industrial area	75	70	67	45
NQ8	Fazalwas Village	Moderately Populated Area	55	45	64.74	43.83
NQ9	Khedhi Kankar Village near Sohna	Low Populated Area	55	45	66.50	42.67
NQ10	New Pirthala Rly station	Railway Yard	55	45	72.57	58.24

Observation and Interpretation Result

1. Day time noise levels (Leq day) at all the ten monitoring locations exceeds the prescribed limits of CPCB, IFC and WHO whereas Night time noise levels (Leq night) are within limits except one location i.e New Pirthala Railway station
2. The industrial activities are away from the rail alignment, hence, no significant noise levels were observed.
3. Marginal increase in noise levels were observed along the rail route which was crossing the highways and nearby the commercial activities.

4.8 SOIL ANALYSIS

Soil may be defined as a thin layer of earth's crust which serves as a natural medium for the growth of plants. It is the unconsolidated mineral matter that has been subjected to and influenced by genetic and environmental factors, such as, parent material, climate, organism and physiochemical action of wind, water and sun light acting over a long period of time. Soil differs from the parent materials in the morphological, physical, chemical and biological properties. Also, soils differ among themselves in some or all the properties depending on the differences in the genetic and environmental factors.

The study on the soil quality establishes the baseline characteristics and identifies the incremental concentrations if any. The soil characteristic includes both physical and chemical details, the soil survey was carried out by the Consultant (OMTC, Jaipur) to assess the soil characteristics of the area. The sampling of soils was done at seven locations once during the study period.

4.8.1 Objectives

The objectives of the sampling are:

- To determine the baseline soil characteristics;
- To monitor the impact on soil (pollutant deposition/other) in long run due to proposed activity.

4.8.2 Soil Sampling Locations

For studying soil quality of the study area, 7 soil samples were collected along the rail route and around the station/junction. The sampling locations are given in **Table 4.26** and shown in **Figure 4.18**. The photograph of soil collection from the sampling sites is given in **Plate 4.7**.

Table 4.26: Sampling Locations for Soil Quality

S. No.	Sample Code	Name of Stations	Aerial distance from Alignment (Km)	Geo-Coordinate		Remark	Frequency
1	SQ1	Forest area near Town Kharkhoda	0.05km	28°48'26.07"N	76°53'26.39"E	Forest Soil	Once during the study period as composite sampling
2	SQ2	Near village Bhopanai	0.11km	28°38'11.73"N	76°48'42.65"E	Wetland Soil	
3	SQ3	Near Farukh nagar Town	1.33km	28°27'17.87"N	76°50'40.99"E	Agriculture Soil	
4	SQ4	Near KMP Manesar	0.05km	28°21'07.84"N	76°52'50.65"E	Forest Soil	
5	SQ5	Kokdilla Pachgaon	0.03km	28°19'14.95"N	76°53'39.09"E	Agriculture Soil	
6	SQ6	Near village Ghuspethi	0.75km	28°12'40.09"N	77°01'34.43"E	Barren Soil	
7	SQ7	Mountain area near starting point of tunnel	1.10km	28°12'15.91"N	77°01'59.93"E	Hilly soil	

Table 4.27: Analysis Methodology of Soil Samples

S. No.	Parameters	Test Method
1.	pH	Is 2720 (part-26)1987(RA-2011)
2.	Conductivity	Is :14767-2000 (RA-2010)
3.	Moisture content	Is:2720 (part-2)1973 (RA-2010)
4.	WHC	LAB-SOP-049
5.	Specific Gravity	Is:2720 (part-3)
6.	Porosity	IS 2720 (part-7)1980(RA-2010)
7.	Bulk density	Is:1462 1985(RA-2006)
8.	Available sodium	LAB-SOP-059

S. No.	Parameters	Test Method
9.	Available potassium	LAB-SOP-060
10.	Available calcium	LAB-SOP-061
11	Available Magnesium	LAB-SOP-062
12	Nitrate Nitrogen	14684:1999(RA-2014)
13	Total Phosphate	LAB-SOP-063
14	Cadmium	USEPA3050B
15	Copper	USEPA3050B
16	Lead	USEPA3050B
17	Manganese	USEPA3050B
18	Zinc	USEPA3050B
19	Iron	USEPA3050B
20	Boron	LAB SOP-96
21	CEC (Cations exchange Capacity)	LAB SOP-085
22	Organic Carbone	Is :2720 (part-22)
23	Available Nitrogen	LAB SOP-95
24	Available phosphorus	LAB SOP-94
25	ESP (Exchangeable Sodium Percentage)	LAB SOP-085
Texture		Is :-2720(part-4)
26	Sand	Is :-2720(part-4)
27	Silt	Is :-2720(part-4)
28	Clay	Is :-2720(part-4)

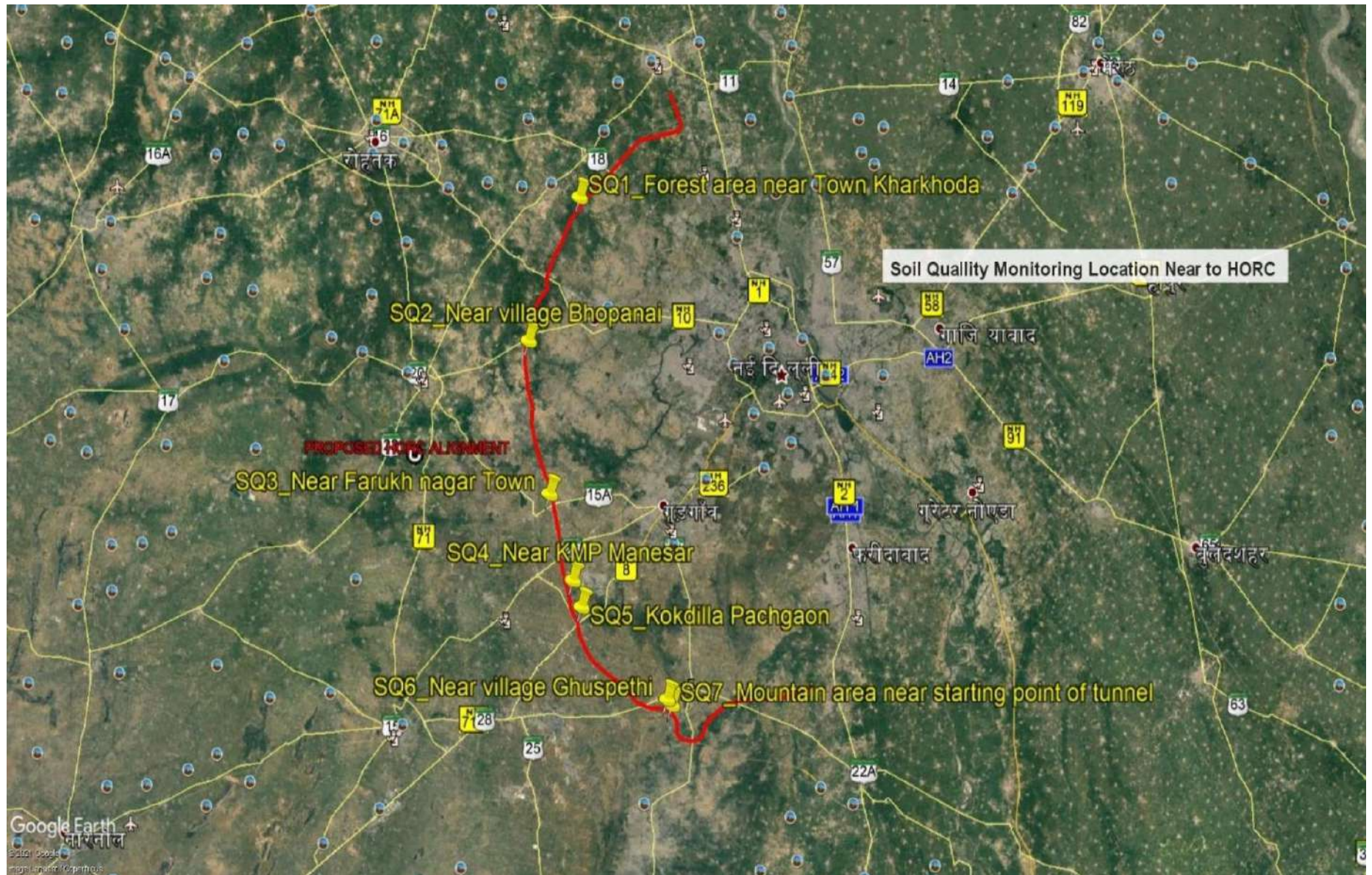


Figure 4.18: Sampling Locations for Soil Quality w.r.t Proposed HARC Alignment

4.8.3 Soil Monitoring Result

The analysis results of the soil sampling are given in **Table 4.28**.

Table 4.28: Soil Sampling Results Along the Rail Route

S. No.	Parameter	Unit	SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7
1	pH		7.82	7.68	7.84	7.74	7.82	7.67	7.88
2	Conductivity	mS/m	40	42	44	42	48	46	46
3	Moisture content	%	3.36	3.52	3.62	3.92	3.62	4.26	4.32
4	Water Holding Capacity	%	33.4	31.62	29.82	32.16	32.55	29.82	32.6
5	Specific Gravity	-	2.59	2.62	2.56	2.6	2.58	2.62	2.58
6	Porosity	%	34.36	34.35	34.38	33.85	33.85	37.4	33.33
7	Bulk density	gm/ml	1.7	1.72	1.68	1.72	1.74	1.64	1.72
8	Available sodium	kg/ha	142	122	120	122	132.6	114	138
9	Available potassium	kg/ha	88	104	136	114	102.4	396	82
10	Available calcium	mg/100g	122	110	124	102	126.4	18.2	116
11	Available Magnesium	mg/100g	24.8	22.34	24	16.56	32.64	20.34	22.6
12	Nitrate Nitrogen	%	0.068	0.082	0.082	0.078	0.068	0.036	0.064
13	Total Phosphate	kg/ha	39.82	48.52	44.68	44.66	42.36	36.52	40.56
14	Cadmium	Mg/kg	1.32	1.62	1.44	1.12	1.42	2.16	1.26
15	Copper	Mg/kg	186	176	226	166	132	172	184
16	Lead	Mg/kg	1.72	1.24	0.94	1.26	1.16	0.96	1.64
17	Manganese	Mg/kg	1.68	1.16	2.18	2.24	2.18	2.14	1.64
18	Zinc	Mg/kg	216	210	136	226	142	82.6	218
19	Iron	Mg/kg	2682	2066	1980	2024	1954	1896	2484
20	Boron	Mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21	CEC(Cation exchange Capacity)	M eq/100gm	28.62	28.42	28.92	26.52	27.92	24.62	29.82
22	Organic Carbon	%	0.86	0.76	0.76	0.8	0.78	0.76	0.82
23	Available Nitrogen	%	0.072	0.078	3.24	0.084	0.088	0.072	0.076
24	Available phosphorus	Kg/ha	42.6	38.46	38.62	38.56	47.56	34.26	40.6
25	ESP(Exchangeable Sodium Percentage)	%	6.52	7.18	7.6	6.48	6.74	6.24	5.62
Texture	Sandy clay loam								
26	Sand	%	58.24	62.34	56.42	22.36	24.62	62.34	66.84
27	Silt	%	18.32	5.02	10.94	9.22	13.14	14.26	14.84
28	Clay	%	23.44	32.64	32.64	68.42	62.24	23.4	18.32

SQ1: Forest area near Town Kharkhoda, SQ2: Near village Bhopanai, SQ3: Near Farukh Nagar Town, SQ4: Near KMP Manesar, SQ5: Kokdilla Pachgaon, SQ6: Near village Ghuspethi, SQ7: Mountain area near starting point of tunnel.

Table 4.29: Standard Soil Classification

S. No.	Soil Test	Classification
1.	pH	<4.5 Extremely acidic 4.51- 5.00 Very strongly acidic 5.51-6.0 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2.	Salinity Electrical Conductivity (mmhos/cm) (1mmho/cm = 640 ppm)	Up to 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops
3.	Organic Carbon (%)	Up to 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4.	Nitrogen (Kg/ha)	Up to 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient
5.	Phosphorus (Kg/ha)	Up to 15 very less 16-30 less 31-50 medium, 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient
6.	Potassium (Kg/ha)	0 -120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient

Source: ICAR (Indian Council for Agricultural Research)

4.8.4 Interpretation of the Analytical Reports

The soil analysis results are compared with the standard soil classification as given in Agriculture Handbook. Samples collected from identified locations indicated that the pH values ranged between **7.67 to 7.88** which showed that the soils were alkaline in nature. Water holding capacity of the soil samples collected were found to be low ranging from **29.82 to 33.4 %**. Potassium values ranged from **82.0 to 396.0 kg/ha** & Total Phosphate varied from **36.52 to 48.52 kg/ha**. Soil is found fertile for phosphorus and potassium but not as much for nitrogen. Thus, top soils are to be preserved separately for the suitable use during construction activities. The detailed lab report is given in **Annexure 4.4**.

4.9 VIBRATION MONITORING

Vibration is mechanical phenomenon whereby oscillation occurs about at an equilibrium point. Vibration consists of rapidly fluctuating motions of the particles without any net movement. Objects can vibrate differently in three mutually independent directions which are vertical, horizontal and lateral. It is common to describe vibration levels in terms of velocity, which represents the instantaneous speed at a point on the object that is displaced. Ambient vibration or environmental vibration seldom has such magnitude to be perceptible or cause audible ground born noise unless there are specific vibration source close by. Such source may be external such as Railway lines, Highway and from Construction sites. In our case vibration may be during construction phase and during operation phase due to running of trains. The project may have impact on vibration level adjoining the proposed project alignment. Vibration levels were measured along the existing railway track that links the existing stations and along the KMP expressway near proposed project alignment/stations. Vibration meter was used to measure the vibration level. Vibrations are transmitted from the source to the ground and propagate through the ground to the receiver.. Measuring the peak particle velocity (PPV) is mostly used for representation of vibrating situation when the pressure wave passes through the particles. Soil conditions have a strong influence on the level of ground-borne vibration. The PPVs are usually expressed in terms of m/s or mm/s.

Methodology of Railway and Background Vibration Measurement: The measuring method of the railway vibration is not set in India. Therefore, Japanese standard of vibration measurement, JIS Z 8735 (Method of Measurement of Vibration Level) was used for vibration measurement which is accepted by the International Organization for Standardization (ISO). Based upon distribution of facilities that needed consideration of vibration impact such as school, hospital, temple, archaeological monuments, wildlife significant sites and residence etc, measurement were carried out at each location. The measuring method is given below.

Item	Specification
Vibration Level Meter	Vibration Level Meter which complies with "JIS C 1510-1:1995" LION VM-53A
Measuring Points	Two points at each site. Basically, 10 m & 25 m from the center of outer railway track. The height is ground level.
Measuring Items	Railway Vibration. Lp (peak level), 1/3 octave frequency analysis (1/3 octave band center frequency: 1-80 Hz). -Background Vibration Lp (peak level)
Vibration Axis	X,Y,Z
Time Weighing Characteristics	630 ms
Measuring Period	Feb 2021
Measuring Time	Railway Vibration: 10:00-18:00 Background Vibration: 10 minutes
Other Data	Date and time, location, train types (freight/passenger) and load (container/bulk), number of train, cars, train length, passenger time, train speed, information on surrounding environment, etc.

4.9.1 Monitoring location for Vibration Analysis

As part of the base line analysis of vibration levels, data was collected through measurement of vibration levels at four locations along parallel existing tracks. Sampling locations for vibration monitoring is given in **Table 4.30** and shown in **Figure 4.19**

Results and discussion

The vibration levels were measured at 4 locations i.e. Jagdishpur (Delhi – Panipat railway line), Jakhoda (Delhi – Rohtak railway line), Sultanpur (Garhi Harsaru - Farukhnagar railway line) and Jurola (Delhi – Rewari railway line) along the existing railway track. Result of vibration recorded at all locations is presented in **Table 4.30**.

Based on vibration monitoring study, it is found that the vibration level varied from 78.6 to 81.6 dB at distance of 10.0 m and 61.7 to 64.9 dB at distance of 20 m from the existing track. The maximum ground vibration was observed as 81.6 dB at Jakhoda (Delhi –Rohtak line) and minimum of 78.6 dB at Jurola (Delhi-Rewari line) at a distance of 10 m from the track. When studied 20m away from Track, the maximum ground vibration of 64.9 dB was observed at Jagdishpur (Delhi-Panipat line) and minimum of 61.7 dB at Jurola(Delhi-Rewari line)

Table 4.30: Vibration Level along the Existing Railway Tracks

S. No.	Existing Railway line	Monitoring Station	Aerial distance from Alignment (Km)	Coordinate	Train Type (No.)	Average Speed (km/hr)	Maximum Speed (km/hr)	Vibration (Max) at 10.0 m from Track (dB)	Vibration (Max) at 20.0 m from Track (dB)
1	Delhi - Panipat	Jagdishpur	0.35km	28°56'4.69"N 77° 2'38.72"E	Passenger Train (04449)	34	110	80.2	64.9
2	Delhi - Rohtak	Jakhoda	2.62km	28°43'43.15"N 76°52'26.20"E	Passenger Train (04453)	36	111	81.6	63.6
3	Garhi Harsaru - Farukhnagar	Sultanpur	0.09km	28°27'40.21"N 76°51'59.68"E	Freight Train	-	-	79.4	62.2
4	Delhi - Rewari	Jurola	2.20km	28°23'47.38"N 76°50'48.16"E	Passenger Train (04470)	33	113	78.6	61.7

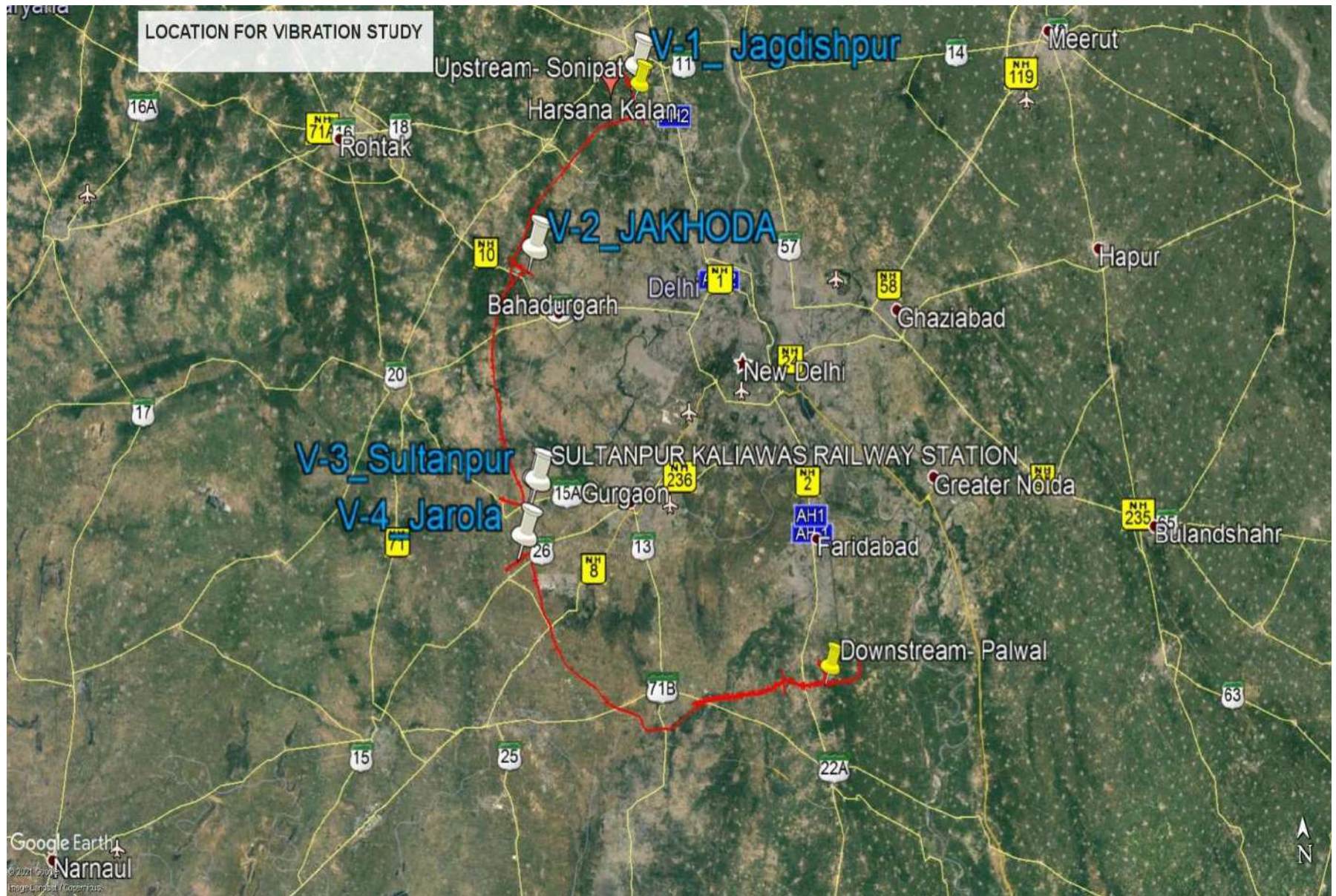


Figure 4.19: Sampling Locations for Vibration w.r.t Proposed HARC Alignment

4.10 BIODIVERSITY

4.10.1 Floristic Composition

The present study on the floral assessment for the proposed project activity is based on extensive field survey of the area. Detailed survey was made along the corridor for collection of baseline data on floral aspects. Roads side plantation, railway line plantation, agricultural area, barren area, forest area was covered in baseline data collection. Inventory of species was prepared on Tree, Shrub, Herb, Climber, Sedge and Grasses with their local name, botanical name, family, habit. Besides the collection of plant species, information was also collected with vernacular names of plant species made by local inhabitants. In this process, the whole study area was divided into different sections to get the maximum diversity of plant species. Sampling locations were selected on the basis of following points.

- a) Natural vegetation in the study area;
- b) Major affected area;
- c) Natural Water Bodies in the study area;
- d) National Parks, Sanctuaries, Reserve / Protected Forest in the study area.

Objectives of study are given below:

- To make an inventory/checklist of plants;
- To analyze the status of flora within Core zone (i.e., in a width of 50 m throughout the alignment), Project Influence area (i.e., centerline to 500 m on either side of the alignment) and Buffer zone (500 m to 5 Km on both side of corridor).

A total of 73 species were recorded (**Table 4.31**). Floristic Composition of Study Area reveals that 63 genera belongs to 37 families of angiospermic plant group in the core and buffer zone. Out of the total 73 plant species, 67 species under 57 genera and 34 families of dicotyledons dominates vegetation of the study area whereas monocotyledon is represented by only 6 species under 6 genera and 3 families. A total of 58 species recorded from core zone (**Table 4.33**) and 73 species from buffer zone (**Table 4.34**).

Table 4.31: Floristic Composition of Study Area on the Basis of Classified Groups

Classified Group		No. of Species	No. of Genera	No. of Family
Angiosperms	Dicotyledons	67	57	34
	Monocotyledons	6	6	3
Total		73	63	37

Out of these 73 species, 35 are trees, 12 are shrubs, 17 are herbs, 5 are grasses and 4 are climbers (**Table 4.36**). The Fabaceae (9 species) and Mimosaceae (7 species) are dominant families and Acacia is dominant genus of the study area (**Plate 4.8**).

Table 4.32: Habit-Wise Floristic Composition of Study Area

S. No.	Major Plant Group	Number of Specie
1	Tree	35
2	Shrub	12
3	Herb	17
4	Grass	5
5	Climber	4

Table 4.33: List of Plant Species Recorded from Study Area (Core Zone)

S. No.	Botanical Name	Local Name	Family	Habit	Division	IUCN Status
1	<i>Abutilon indicum</i>	Kangi	Malvaceae	H	D	-
2	<i>Acacia auriculiformis</i>	-	Mimosaceae	T	D	-
3	<i>Acacia farnesiana</i>	-	Mimosaceae	T	D	-
4	<i>Acacia jacquemontii</i>	Babul	Mimosaceae	T	D	-
5	<i>Acacia leacophloea</i>	Raunj	Mimosaceae	T	D	-
6	<i>Acacia nilotica</i> var. <i>indica</i>	Kikar	Mimosaceae	T	D	-
7	<i>Acacia senegal</i>	Khairi	Mimosaceae	T	D	-
8	<i>Achyranthes aspera</i>	Chirchita	Amaranthaceae	H	D	-
9	<i>Adhatoda vasica</i>	Bansa	Acanthaceae	S	D	-
10	<i>Agava americana</i>	Keora	Asparagaceae	S	D	-
11	<i>Ageratum conyzoides</i>	-	Asteraceae	H	D	LC
12	<i>Amaranthus gracilis</i>	Cholai	Amaranthaceae	S	D	-
13	<i>Anogeissus pendula</i>	Dhauk	Combretaceae	T	D	-
14	<i>Argemone mexicana</i>	Kanteli	Papaveraceae	H	D	-
15	<i>Boswellia serrata</i>	Salai	Burseraceae	T	D	-
16	<i>Bougainvillea</i> sp.	-	Nyctaginaceae	S	D	-
17	<i>Calotropis procera</i>	Aak	Apocynaceae	S	D	-
18	<i>Cannabis sativa</i>	Bhang	Cannabaceae	S	D	-
19	<i>Capparis decidua</i>	Karir	Capparidaceae	S	D	LC
20	<i>Carissa spinarum</i>	Karunda	Apocynaceae	S	D	LC
21	<i>Cassia tora</i>	Panwar	Caesalpinaceae	H	D	-
22	<i>Cenchrus ciliaris</i>	Anjan	Poaceae	G	M	-
23	<i>Chenopodium album</i>	Bathua	Amaranthaceae	H	D	-
24	<i>Chrysopogon montanus</i>	Dhotu	Poaceae	G	M	-
25	<i>Cordia dichroma</i>	Lasura	Boraginaceae	T	D	-
26	<i>Cuscuta reflexa</i>	Aakash Bel	Cuscutaceae	C	D	-
27	<i>Cynodon dactylon</i>	Doob grass	Poaceae	G	M	-
28	<i>Dalbergia sissoo</i>	Shisham	Fabaceae	T	D	-
29	<i>Datura alba</i>	Dhatura	Solanaceae	S	D	-
30	<i>Digeria muricata</i>	Jungli Sag	Amaranthaceae	H	D	-
31	<i>Eucalyptus</i> sp.	Safeda	Myrtaceae	T	D	-
32	<i>Ficus benghalensis</i>	Barh	Moraceae	T	D	-
33	<i>Ficus religiosa</i>	Peepal	Moraceae	T	D	-
34	<i>Holoptelea intergrifolia</i>	Pahari Papri	Ulmaceae	T	D	-
35	<i>Leucaena leucocephala</i>	Su-Babul	Fabaceae	T	D	-
36	<i>Lantana camara</i>	Lantana	Verbenaceae	S	D	-
37	<i>Melia azedarach</i>	Bakain	Meliaceae	T	D	-
38	<i>Morus alba</i>	Toot	Moraceae	T	D	-
39	<i>Parthenium hysterophorus</i>	Congress grass	Asteraceae	H	D	-
40	<i>Phoenix sylvestris</i>	Khajur	Arecaceae	T	M	-
41	<i>Phyllanthus niruri</i>	Bhumi Amalki	Euphorbiaceae	H	D	-
42	<i>Physalis minima</i>	Rusbari	Solanaceae	H	D	-
43	<i>Pongamia pinnata</i>	Papri, Karanj	Fabaceae	T	D	LC
44	<i>Prosopis cineraria</i>	Jand	Fabaceae	T	D	-

S. No.	Botanical Name	Local Name	Family	Habit	Division	IUCN Status
45	<i>Prosopis glandulosa</i>	Vilayati Kikar	Fabaceae	T	D	-
46	<i>Prosopis juliflora</i>	Vilayati Kikar	Fabaceae	T	D	-
47	<i>Ricinus communis</i>	Arand	Euphorbiaceae	S	D	-
48	<i>Saccharum spontaneum</i>	Kandera	Poaceae	G	M	LC
49	<i>Solanum nigrum</i>	Makoi	Solanaceae	H	D	-
50	<i>Solanum xanthocarpum</i>	Kateli	Solanaceae	H	D	-
51	<i>Syzygium cumini</i>	Jamun	Myrtaceae	T	D	-
52	<i>Terminalia arjuna</i>	Arjun	Combretaceae	T	D	-
53	<i>Tinospora cordifolia</i>	Giloi	Menispermaceae	C	D	-
54	<i>Tribulus terrestris</i>	Gokhru	Zygophyllaceae	H	D	LC
55	<i>Vallisneria spiralis</i>	Dudhi	Apocynaceae	C	D	-
56	<i>Withania somnifera</i>	Ashwagandha	Solanaceae	H	D	-
57	<i>Xanthium strumarium</i>	-	Asteraceae	H	D	-
58	<i>Ziziphus sp.</i>	Ber	Rhamnaceae	S	D	-

Table 4.34: List of Plant species Rerecorded from Study Area (Buffer Zone)

S. No.	Botanical Name	Local Name	Family	Habit	Division	IUCN Status
1	<i>Abutilon indicum</i>	Kangi	Malvaceae	H	D	-
2	<i>Acacia auriculiformis</i>	-	Mimosaceae	T	D	-
3	<i>Acacia farnesiana</i>	-	Mimosaceae	T	D	-
4	<i>Acacia jacquemontii</i>	Babul	Mimosaceae	T	D	-
5	<i>Acacia leucophloea</i>	Raunj	Mimosaceae	T	D	-
6	<i>Acacia nilotica var. indica</i>	Kikar	Mimosaceae	T	D	-
7	<i>Acacia senegal</i>	Khairi	Mimosaceae	T	D	-
8	<i>Acacia tortilis</i>	-	Mimosaceae	T	D	-
9	<i>Achyranthes aspera</i>	Chirchita	Amaranthaceae	H	D	-
10	<i>Adhatoda vasica</i>	Bansa	Acanthaceae	S	D	-
11	<i>Agave americana</i>	Keora	Asparagaceae	S	D	-
12	<i>Ageratum conyzoides</i>	-	Asteraceae	H	D	LC
13	<i>Ailanthus excelsa</i>	Ulloo Neem	Simaroubaceae	T	D	-
14	<i>Albizia lebbek</i>	Siris	Fabaceae	T	D	-
15	<i>Amaranthus gracilis</i>	Cholai	Amaranthaceae	S	D	-
16	<i>Anogeissus pendula</i>	Dhauk	Combretaceae	T	D	-
17	<i>Argemone mexicana</i>	Kanteli	Papaveraceae	H	D	-
18	<i>Bombax ceiba</i>	Semal	Bombacaceae	T	D	-
19	<i>Boswellia serrata</i>	Salai	Burseraceae	T	D	-
20	<i>Bougainvillea sp.</i>	-	Nyctaginaceae	S	D	-
21	<i>Butea monosperma</i>	Dhak	Fabaceae	T	D	-
22	<i>Calotropis procera</i>	Aak	Apocynaceae	S	D	-
23	<i>Cannabis sativa</i>	Bhang	Cannabaceae	S	D	-
24	<i>Capparis decidua</i>	Karir	Capparidaceae	S	D	LC

S. No.	Botanical Name	Local Name	Family	Habit	Division	IUCN Staus
25	<i>Carissa spinarum</i>	Karunda	Apocynaceae	S	D	LC
26	<i>Cassia tora</i>	Panwar	Caesalpinaceae	H	D	-
27	<i>Cenchrus ciliaris</i>	Anjan	Poaceae	G	M	-
28	<i>Chenopodium album</i>	Bathua	Amaranthaceae	H	D	-
29	<i>Chrysopogon montanus</i>	Dhotu	Poaceae	G	M	-
30	<i>Cordia dichroma</i>	Lasura	Boraginaceae	T	D	-
31	<i>Cucumis pubescens</i>	Kachri	Cucurbitaceae	C	D	-
32	<i>Cuscuta reflexa</i>	Aakash Bel	Cuscutaceae	C	D	-
33	<i>Cynodon dactylon</i>	Doob	Poaceae	G	M	-
34	<i>Cyperus rotundus</i>	Motha	Cyperaceae	G	M	-
35	<i>Dalbergia sissoo</i>	Shisham	Fabaceae	T	D	-
36	<i>Datura alba</i>	Dhatura	Solanaceae	S	D	-
37	<i>Digeria muricata</i>	Jungli Sag	Amaranthaceae	H	D	-
38	<i>Eucalyptus sp.</i>	Safeda	Myrtaceae	T	D	-
39	<i>Ficus benghalensis</i>	Barh	Moraceae	T	D	-
40	<i>Ficus glomerata</i>	Gullar	Moraceae	T	D	-
41	<i>Ficus religiosa</i>	Peepal	Moraceae	T	D	-
42	<i>Holoptelea intergrifolia</i>	Pahari Papri	Ulmaceae	T	D	-
43	<i>Leucaena leucocephala</i>	Su-Babul	Fabaceae	T	D	-
44	<i>Lantana camara</i>	Lantana	Verbenaceae	S	D	-
45	<i>Mangifera indica</i>	Aam	Anacardiaceae	T	D	-
46	<i>Melia azedarach</i>	Bakain	Meliaceae	T	D	-
47	<i>Mitragyna parvifolia</i>	Phaldu	Rubiaceae	T	D	-
48	<i>Moringa oleifera</i>	Sohanjna	Moringaceae	T	D	-
49	<i>Morus alba</i>	Toot	Moraceae	T	D	-
50	<i>Parthenium hysterophorus</i>	Congress grass	Asteraceae	H	D	-
51	<i>Phoenix sylvestris</i>	Khajur	Arecaceae	T	M	-
52	<i>Phyllanthus emblica</i>	Aamla	Euphorbiaceae	T	D	-
53	<i>Phyllanthus niruri</i>	-	Euphorbiaceae	H	D	-
54	<i>Physalis minima</i>	Rusbari	Solanaceae	H	D	-
55	<i>Pongamia pinnata</i>	Papri, Karanj	Fabaceae	T	D	LC
56	<i>Prosopis cineraria</i>	Jand	Fabaceae	T	D	-
57	<i>Prosopis glandulosa</i>	-	Fabaceae	T	D	-
58	<i>Prosopis juliflora</i>	Vilayati Kikar	Fabaceae	T	D	-
59	<i>Ricinus communis</i>	Arand	Euphorbiaceae	S	D	-
60	<i>Saccharum spontaneum</i>	Kandera	Poaceae	G	M	LC
61	<i>Solanum nigrum</i>	Makoi	Solanaceae	H	D	-
62	<i>Solanum xanthocarpum</i>	Kateli	Solanaceae	H	D	-
63	<i>Stellaria media</i>	-	Caryophyllaceae	H	D	-
64	<i>Syzygium cumini</i>	Jamun	Myrtaceae	T	D	-
65	<i>Tamarindus indica</i>	Imli	Fabaceae	T	D	LC

S. No.	Botanical Name	Local Name	Family	Habit	Division	IUCN Staus
66	<i>Terminalia arjuna</i>	Arjun	Combretaceae	T	D	-
67	<i>Tinospora cordifolia</i>	Giloi	Menispermaceae	C	D	-
68	<i>Tribulus terrestris</i>	Gokhru	Zygophyllaceae	H	D	LC
69	<i>Tridax procumbens</i>	Sadahari	Asteraceae	H	D	-
70	<i>Vallis solanacea</i>	Dudhi	Apocynaceae	C	D	-
71	<i>Withania sominifera</i>	Ashwagandha	Solanaceae	H	D	-
72	<i>Xanthium strumarium</i>	Burchuta	Asteraceae	H	D	-
73	<i>Ziziphus sp.</i>	Ber	Rhamnaceae	S	D	-

(Abbreviation: D=Dicot, M=Monocot, H=Herb, S= Shrub, T=Tree, G=Grass, C=Climber)

Out of the enumerated 73 plant species, *Acacia nilotica var. indica*, *Phyllanthus emblica*, *Terminalia arjuna*, *Bombax ceiba*, *Cordia dichotoma*, *Tribulus terrestris*, *Withania sominifera*, *Tinospora cordifolia*, *Datura alba*, *Cuscuta reflexa*, *Solanum nigrum* and *Phyllanthus niruri* are used as ethnobotanically and ethnomedicinally in the study area.

IUCN Status of Plant Species

The total 73 plant species recorded under this proposed project were examined for their status under IUCN Red List of Threatened Plant species ver. 3.1 as on April 20, 2021. This revealed that majority of species are not assessed for their IUCN status and 7 species have been put under Least Concern (LC) category (Table 4.33 & 4.34). No threatened species have been recorded during the present survey.

4.10.2 Fauna and Avi-Fauna

A detailed survey for identification and documentation of important animal groups i.e. Avian, Reptilian, Amphibian and mammals was carried out in the impact zone (Core zone and buffer zone) of the proposed HORC project. From the survey, identification and documentation were carried out for Avi-fauna, Amphibian, Mammal and other faunal diversity. Observations on faunal diversity were carried out on the basis of direct and indirect evidences, trails (sighting during ecological studies, pugmarks, fecal material present on bern of path, urine marks, landering, dropping below hugetrees). Identification of birds was done on the basis of recording voice of the birds during day and night and also surveyed of habitats of the birds (old wells, old closed houses, old trees trunks, etc.).

The presence of wildlife was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the project area. During the survey, a total of 13 species of mammals have been recorded from the study site. The common species are (Common Field Mouse) *Apodemus sylvaticus*, (Indian Mole Rat) *Bandicota bengalensis*, (Wild boar) *Sus scrofa*, *Boselaphus tragocamelus* (Blue Bull) etc (Table 4.35).

The mammals spotted and recorded during the survey in the study area are listed in Table 4.35. Mostly of species are in Schedule –IV followed by Schedule V, III & II. Among the mammals Common Indian krait, House Rat, Palm Squirrel etc are mostly abundant. Out of 13 listed mammals only Mongoose falls, Rhesus Macaque & Hanuman langur falls under Schedule-II and rest under Schedule-III, IV & V as per Indian Wildlife Protection Act 1972. Some of the species are shown in Plate 4.9. All the mammals species have

been assessed the IUCN status. Out of the 13 species of mammals, 8 species have been found under the least concern (LC) category and one species (*Herpestes brachyurus*) is near threatened (NT) category.

Table 4.35: Diversity of Fauna (Mammals) in the Study Area

S. No.	Scientific Name	Local Name	Family	Schedule As Per Indian Wild Life Protection Act 1972	IUCN Status
1.	<i>Suncus murinus</i>	Grey Musk Shrew	Soricidae	Schedule V	LC
2.	<i>Lepus negricollis</i>	Indian Hare	Leporidae	Schedule IV	-
3.	<i>Apodemus sylvaticus</i>	Common Field Mouse	Muridae	Schedule V	LC
4.	<i>Bandicota bengalensis</i>	Indian Mole Rat	Muridae	Schedule V	LC
5.	<i>Sus scrofa</i>	Wild boar	Suidae	Schedule III	LC
6.	<i>Boselaphus tragocamelus</i>	Blue bull	Bovidae	Schedule III	LC
7.	<i>Herpestes brachyurus</i>	Mongoose	Herpestidae	Schedule II	NT
8.	<i>Bungarus caeruleus</i>	Common indian krait	Elapidae	Schedule IV	-
9.	<i>Rattus rattus</i>	House Rat	Muridae	Schedule V	LC
10.	<i>Lepus negricollis</i>	Indian Hare	Leporidae	Schedule IV	-
11.	<i>Funambulus pennanti</i>	Palm Squirrel	Sciuridae	Schedule IV	LC
12.	<i>Macaca mulatta</i>	Rhesus Macaque	Cercopithecidae	Schedule II	LC
13.	<i>Semnopithecus</i> sp.	Hanuman langur	Cercopithecidae	Schedule II	-

During the survey, a total of 19 species of avi-fauna have been recorded from the study site. The birds spotted and recorded during the survey in the study area are listed in the **Table 4.36**. Among the birds Crows, Bank Myna, Laughing dove, etc. were abundant. Even House Sparrow (*Passer domesticus*) was abundant in some villages. Out of 18 listed bird species only Indian peafowl falls under Schedule-I, common myna falls under Schedule-III, House crow under Schedule-V and rest 15 falls under Schedule – IV and as per Indian Wildlife Protection Act 1972. Some of the species are shown in **Plate 4.10**. All the bird species have been assessed for the IUCN status. Out of the 18 species of birds, 11 species have been found under the least concern (LC) category and one species (*Mycteria leucocephala*) is near threatened (NT) category.

Table 4.36: Diversity of Avi-fauna (Bird) in the Study Area

S. No.	Scientific Name	Local Name	Family	Schedule As Per Indian Wildlife Protection Act 1972	IUCN Status
1.	<i>Phalacrocorax niger</i>	Little Cormorant	Phalacrocoracidae	Schedule IV	LC
2.	<i>Columba livia</i>	Rock Pigeon	Columbidae	Schedule IV	LC
3.	<i>Acridotheres tristis</i>	Common myna	Stumidae	Schedule III	LC
4.	<i>Pavo cristatus</i>	Indian peafowl	Phasianidae	Schedule I	LC

S. No.	Scientific Name	Local Name	Family	Schedule As Per Indian Wildlife Protection Act 1972	IUCN Status
5.	<i>Halcyon smyrnensis</i>	White Throated Kingfisher	Alcedinidae	Schedule IV	LC
6.	<i>Fulica atra</i>	Coot (M)	Rallidae	Schedule IV	LC
7.	<i>Amaurornis phoenicurus</i>	White Breasted Waterhen	Rallidae	Schedule IV	LC
8.	<i>Motacilla alba</i>	White wagtail	Motacillidae	Schedule IV	LC
9.	<i>Mycteria leucocephala</i>	Painted storks	Ciconiidae	Schedule IV	NT
10.	<i>Vanellus indicus</i> Schedule	Red Wattled Lapwing	Charadriidae	Schedule IV	-
11.	<i>Streptopelia tranquebarica</i>	Red Collared Dove	Columbidae	Schedule IV	-
12.	<i>Saxicoloides fulicata</i>	Indian Robin	Muscicapidae	Schedule IV	LC
13.	<i>Corvus macrorhynchos</i>	Jungle Crow	Corvidae	Schedule IV	LC
14.	<i>Corvus splendens</i>	House crow	Corvidae	Schedule V	-
15.	<i>Acridotheres ginginianus</i>	Bank Myna	Sturnidae	Schedule IV	-
16.	<i>Merops orientalis</i>	Small Bee-Eater	Meropidae	Schedule IV	-
17.	<i>Streptopelia senegalensi</i>	Little Brown Dove/ Laughing Dove	Columbidae	Schedule IV	LC
18.	<i>Passer domesticus</i>	House sparrow	Passeridae	Schedule IV	-

4.10.3 Amphibian

Asian common toad of amphibian fauna (*Duttaphrynus melanostictus*) was reported during the field survey in the core zone of the study area.

4.10.4 Agricultural & Horticultural Crops of the study area

Haryana is primarily an agricultural state. About 70% of residents are engaged in agriculture. Wheat and rice are the major crops grown here. Haryana is self-sufficient in food production and the second largest contributor to India's central pool of food grains. The cropping patterns are based upon Rabi & Kharif types of crops. Rabi crops include wheat, millet and maize, while the Kharif crops include soybean, pulses & cereals. The alluvial soils are very suitable for Cash crops (**Plate 4.11**). The district wise cropping pattern in the study area is given in **Table 4.37**:

Table 4.37: Agriculture Crop of the Project Districts

Name of District	Local name of crop (Botanical name)
Palwal	Jowar (<i>Sorghum vulgare</i>), Barley (<i>Hordeum vulgare</i>), Wheat (<i>Triticum aestivum</i>), Sugarcane (<i>Saccharum officinarum</i>), Mustard (<i>Brassica</i> sp.)
Nuh	Wheat (<i>Triticum aestivum</i>), Mustard (<i>Brassica</i> sp.) Jowar (<i>Sorghum vulgare</i>), Bajra (<i>Pennisetum glaucum</i>)
Gurugram	Jowar (<i>Sorghum vulgare</i>), Wheat (<i>Triticum aestivum</i>), Mustard (<i>Brassica</i> sp.) Barley (<i>Hordeum vulgare</i>), Bajra (<i>Pennisetum glaucum</i>)

Name of District	Local name of crop (Botanical name)
Jhajjar	Wheat (<i>Triticum aestivum</i>), Mustard (<i>Brassica</i> sp.) Jowar (<i>Sorghum vulgare</i>), Bajra (<i>Pennisetum glaucum</i>), Rice (<i>Oryza sativa</i>)
Sonipat	Jowar (<i>Sorghum vulgare</i>), Sugarcane (<i>Saccharum officinarum</i>), Rice (<i>Oryza sativa</i>) Wheat (<i>Triticum aestivum</i>), Mustard (<i>Brassica</i> sp.)

4.10.5 Tree Cutting Details

Project alignment is parallel to existing DFCCIL track and KMP (Kundli – Maneshr Palwal) expressway. Tree cutting and vegetation clearing is expected to be an essential part of the construction of the corridor. Therefore, compensatory plantation in nearby areas will be initiated. Planning for the regular watering, nourishing and protection of the planted trees will ensure their effective restoration as part of the compensatory afforestation programme.

The study was conducted to count the tree species in RoW of proposed HORC project. All the plant species with girth at breast height (gbh) > 30 cm were considered and recorded as trees (Parthasarathy and Karthikeyan, 1997). The girth at breast height (gbh) was measured for all species of trees.

As per survey and study it is estimated that approximately 6499 trees will be required to be removed for the HORC corridor.. The summary of total number of trees to be removed is provided in **Table 4.38**.

Most of trees that will be cut for the project are natural plantation, agriculture plantation, road side plantation, canal planation, railway track planation etc. In agriculture field plants, trees are planted on the boundary of the fields. The plantations of agriculture field have fruit bearing, shade tree and agroforestry (*Aegle marmelos*, *Ziziphus* sp., *Syzygium cumini*, *Mangifera indica*, *Dalbergia sissoo*, *Eucalyptus* spp., *Ailnathus excela*, *Populus* sp. *Acacia* spp. *Prosopis* sps). In natural vegetation, the species composition is *Acacia* sp. *Prosopis* spp. *Ziziphus* sp. *Dalbergia sissoo*, *Phoenix dactylifera*, *Leucaena leucocephala* etc. Road side plantation has *Pongamia pinnata*, *Ailnathus excela*, *Albizia lebbbeck*, *Eucalytus* spp and *Acacia* spp. The chainage wise detail of tree to be cut due to proposed HORC project is given in **Annexure 4.6**.

Table 4.38: Detail of Tree Census for Proposed HORC Project

Name of district	Name of tehsil	Name of village	Number of trees to be cut	From Chainages (M)	To Chainages (M)
Palwal	Palwal	Prithla	18	-2000	-1476
		Chhaprola	25	-1307	2460
		Dehlaka	5	3380	3400
		Paroli	8	4220	4540
Gurugram	Sohna	Ratikanoabad	3	6530	6530
		Khuntpuri	12	6770	8010
		Silani	8	8500	8690
		Karanki	34	11110	11590
Nuh	Nuh	Bhirawati	13	11810	12040
Gurugram	Sohna	Sancholi	11	12160	12300
Nuh	Nuh	Atta	7	15000	15550
		Indri	2	15880	16720
		Khanpur	9	17770	18190

Name of district	Name of tehsil	Name of village	Number of trees to be cut	From Chainages (M)	To Chainages (M)
		Kherli kankar	16	21000	21700
		Rupaheri	5	23080	23200
		Rojka meo	12	24140	24180
	Tauru	Sehsaula	3	27750	27760
		Maindla	37	28000	28550
		Dhulawat	76	28610	30190
		Bidhuwas	68	30360	30610
		Padheni	12	31110	32570
		Gogjaka	2	33200	
		Goela	254	33390	34840
		Deengarheri	32	34900	36110
		Sabras	139	36470	38110
		Kalwari	40	38880	41000
		Gurugram	Manesar	Udepuri	8
Chandla dungarwas	46			43330	44240
Fazalwas	94			44650	45170
Kukrola	61			45490	46140
Fakharpur	12			46190	46630
Kasan	5			46790	46930
Mokalwas	136			47130	47820
Kasan	14			48100	49330
F. Nagar	Jhund Sarai Abad		1803	53670	
			151	53670	54070
	Patli hajipur		149	55900	58650
	Khentawas		10	58850	59180
	Sultanpur		23	61590	64290
	Jhanjrola		4	64600	65470
Mubarikpur	4	65560	66350		
Jhajjar	Badli	Mundakhera	12	67100	69570
		Ismilpur	1	69570	
		Dewarkhana	1	69890	
		Lagarpur	4	70150	71400
		Badli	9	72100	72510
		Daryapur	24	73130	74190
		Badli	149	74710	78050
		Majri	4	78700	79000
	Bahadurgarh	Bupania	27	80000	83690
		Dabodha khurd	18	84680	86380
		Mehandipur	1	87730	
		Mandothi	43	88010	93350
		Jakhoda	40	93450	
			35	93550	
Asaudha todran		101	94110	98190	
Jasour kheri		43	98470	100000	
Kheri jasour	14	100100	101730		

Name of district	Name of tehsil	Name of village	Number of trees to be cut	From Chainages (M)	To Chainages (M)
		Nilothi	23	101930	102250
Sonipat	Kharkhoda	Kirauli	12	102650	103000
		Pai	8	105010	105010
		Prahladpur	140	105150	105450
		Barona	81	105940	106800
		Gopalpur	146	106800	1080800
		Pipli	657	1090090	111950
		Thana kalan	658	112570	113700
		Turakpur	13	113900	114730
		Turakpur	3	115110	
		Mandora	206	115570	118900
		Sonipat	Nahra	2	119300
	Mahla majra		15	119690	120520
	Chhatehra bhadurpur		59	121050	121600
	Mahla majra		6	121760	
	Rai	Akbarpur barota	12	122590	123410
	Sonipat	Jagdishpur	262	124200	126500
		Nasirpur bangar	178	127100	
		Harsana khurd	62	127000	127500
		Harsana kalan	59	127670	128000
	Total			6499	

4.10.6 Critical Habitat Assessment using International Finance Corporation Criteria

The International Finance Corporation (IFC) requires a client seeking funding for their proposed project to assess environmental and social risks using eight Performance Standards. Performance Standard 6 (PS 6) and the relevant Guidance Note 6 focus on the protection and conservation of biodiversity. In most cases, the required conservation outcome under PS6 is no-net-loss of biodiversity value achieved using the “like-for-like” or better principle of biodiversity offsets. However, when a project occurs in critical habitat (CH) supporting exceptional biodiversity value, a net gain in biodiversity value is required.

If the project area falls under high biodiversity values, an assessment for critical habitat identification is required by PS6 to manage risks and avoid, mitigate, and offset impacts. Such high biodiversity values areas are identified with following characteristics;

1. Habitat of significant importance to Critically Endangered (CR) and/or Endangered (EN) species;
2. Habitat of significant importance to endemic and/or restricted-range species;
3. Habitat supporting significant global concentrations of migratory species;
4. Highly threatened and/or unique ecosystems;
5. Areas associated with key evolutionary processes.

In the light of PS6, following criteria/approaches have been used for critical habitat analysis of the proposed project during the baseline data collection stage;

1. Initial literature review and consultation with forest department;

2. In-field data collection and field verification of existing information;
3. Identification of RET species as per red list of International Union for Conservation of Nature (IUCN) and nationally (BSI; ZSI; IWPA, 1972)/regionally listed species assessed;
4. Habitats of significant importance for endemic species;
5. Presence of ecologically protected areas, if any and impact of project on such areas.

On the detailed examination of above criteria, it is concluded for the proposed project that:

- A total 73 plant species were recorded in base line data collection. All plants species were examined for their status under IUCN Red List of Threatened Plant species ver. 3.1 as on April 20, 2021. This revealed that majority of species are not assessed for their IUCN status. No threatened and endemic species have been found in the recorded floral species. Only 7 species are recognized under Least Concern (LC) category;
- During the survey, a total of 13 species of mammals and 18 species of avi-fauna have been recorded from the study site. Only 4 species of mammals and 3 species of avi – fauna have been found under the least concern (LC) category of IUCN. As per IUCN status of species, no threatened and endemic species have been recorded during survey. Only Indian peafowl fall under Schedule-I *and* common myna fall under Schedule-III species as per Indian Wildlife Protection Act 1972;
- No presence of habitat of significant importance for any Critically Endangered (CR) and/or Endangered (EN) and endemic species is found through direct and indirect evidences in the influence zone of the proposed alignment;
- No permanent habitat is recognized for migratory bird species;
- No areas associated with evolutionary processes for flora and fauna has been reported in the influence zone of proposed alignment;
- There is no Wildlife Sanctuaries, Biosphere Reserves, and Wildlife Corridors falling in the study area except Sultanpur National Park which lies at a distance of 2.3 km from the proposed HORC alignment. The limit of eco-sensitive zone of Sultanpur National Park is 5 km from its boundary and as per Gazette notification (MoEF&CC, 2009), it is necessary to conserve and protect area upto five kilometers from the boundary of the protected area as Eco-sensitive Zone from ecological and environmental point of view. It is to be noted that KMP expressway also passed through the eco-sensitive zone of Sultanpur National Park;
- No major threat for biodiversity has been recognized.

No major emissions of pollutant take place in atmosphere due to operation of railway project and there is no major threat to biodiversity due to this proposed railway project. So, proposed alignment is safe for environment.

4.10.7 Sensitive Receptor along the proposed alignment

Sensitive Receptor means any location where routine or normal activities occurring at reasonably expected times would experience adverse effects from different construction or developmental including one or a combination of: residences or facilities where people sleep (e.g., single and multi-unit dwellings, nursing homes, hospitals, trailer parks, camping grounds, etc.), institutional facilities (e.g., schools, churches, community centres, day care centres, recreational centres, etc.), outdoor recreational areas (e.g., trailer

parcs, play grounds, picnic areas). The details of the sensitive receptors nearby to project alignment are given below in **Table 4.39**. As observed from this table, there are 13 hospitals situated within the arial distance of 6 km, 2 schools within the arial distance of 4 km and one temple at the arial distance of 20 m..

Table 4.39: Sensitive Receptors within 10 Km on Each Side of Proposed alignment.

S. No.	Sensitive Receptors	Arial Distance (KM)	Side of Alignment
(A) Hospitals			
1	Sri Sathya Sai Sanjeevani International Centre for Child Heart Care & Research (Baghola)	5.57	Left
2	C.H.C Dudhola Govt. hospital	3.08	Left
3	Civil Hospital- Baluda Rd Rajoria Nagar-Sohna	6.27	Right
4	Anand Hospital (Tauru)	3.33	Left
5	Civil Hospital- Tauru	4.11	Left
6	ESIC Hospital (IMT Manesar Sector 3)	3.63	Right
7	Government Hospital- Sohna, Gurugram	3.58	Right
8	Ujala Cygnus J. K. Hindu Hospital (Old Rohtak Rd near Hindu College of Engineering Industrial Area)	4.45	Left
9	Janta Charitable . H	5.3	Left
10	Memorial Hospital (Mama Bhanja Chowk Anand Nagar)	5.64	Left
11	Haryana Multispecialty Hospital	5.17	Left
12	Tulip Hospital	5.16	Left
13	Civil Hospital (Delhi Road, Near Maharana Pratap Chowk)	4.98	Left
(B) Schools			
1	Mewat Model School, Nuh	3.55	Left
2	G C Senior Secondary School	3.11	Left
(C) Religious Place			
1	Hanuman Panchmukhi Mandir	>20 mtrs	Right

4.10.8 Environmental Sensitive Areas along the proposed alignment

Environmental sensitive area is an area where the natural environment can easily be harmed. These areas can be landscape elements or places which are vital to the long-term maintenance of biological diversity, soil, water or other natural resources both on the site and in a regional context. They include wildlife habitat areas, steep slopes, wetlands, and prime agricultural lands etc.

There are no conservation/ preservation areas in the form of any biosphere reserve, wildlife sanctuary in the vicinity of the proposed project except Sultanpur National Park which is about 2.3 km from the HORC alignment. Details of Reserved and protected forest are given below in **Table 4.40**.

Table 4.40: List of Reserved and Protected Forest Closest to the Proposed Alignment

S. No.	Forest Category	Name	Distance From Proposed Railway Alignment (in Km)
1	Reserve	Bawana RF	9.68
2	Reserve	Sir Bisanpur RF	3.95
3	Reserve	Rangala RF	5.8
4	Protected	Mamupur, Narela PF	7.71 Km
5	Protected	Tapkan PF	4.19 Km

Source: ESIA consultants

4.10.9 Environment Features

Environmental features are those natural or manmade attractions which alter or enhance the environment view. Along the project alignment, the identified environment features includes 28 habitat locations, 4 major water bodies, 8 nos of Canals. The details of environmental features along with aerial distance and side of alignment is given in **Table 4.41**.

Table 4.41: Environment Features Nearby the Proposed HORC Alignment

S. No.	(A) Nearest Habitat Location	Arial Distance (KM)	Side of Alignment
1	Asoti	> 0.19	Right
2	Jataula	> 0.13	Left
3	Prithala	0.42	Left
4	Chhaprola	0.11	Right
5	Khoontpuri	0.1	Left
6	Silani	0.22	Left
7	Karnki	0.34	Right
8	Sancholi	0.32	Right
9	Padheni	0.02	Left
10	Sheikhpur	0.12	Left
11	Kalwari	0.3	Left
12	Fazalwas	0.06	Left
13	Eakharpur	0.23	Left
14	Mokalwas	0.14	Left
15	IMT Maneswar	0.13	Right
16	Patli Hajipur	0.66	Left
17	Sultanpur	0.9	Right
18	Badli	0.81	Left
19	Bupania	0.85	Right
20	Daboda Khurd	0.26	Right
21	Mandothi	0.72	Left
22	Asauda	0.83	Right
23	Jasaur Kheri	0.69	Left
24	Pehladpur Kirholi	0.59	Right
25	Malha Majra	0.21	Right
26	Chhatera Bahadurpur	0.54	Left
27	Mandaur	0.37	Right
28	Jagdishpur	0.05	Right

(B) MAJOR WATER BODIES			
1	Sultanpur Lake	3.40km	Right
2	Damdama Lake	8.0km	Right
3	Bhindawas	27.04km	Left
4	Khaparwas	29.10km	Left
(C) Canals			
1	Agra Canal	0 Km (Intersect)	-
2	C - 3	0 Km (Intersect)	-
3	C - 4	0 Km (Intersect)	-
4	C - 5	0 Km (Intersect)	-
5	C - 6	0 Km (Intersect)	-
6	C - 7	0 Km (Intersect)	-
7	C - 8	0 Km (Intersect)	-
8	C - 9	0 Km (Intersect)	-

4.10.10 Overall Observation and Interpretation

- It has been noted that the construction phase in rail alignment is critical phase than the operation phase. As the main activity will be laying of rails and excavation of land i.e. 10m-15m along the stretch. From the above baseline survey, no threatened plant species were observed along the route but open trenching will create temporary hindrance of wild animals and possibly of death may occur in case of small mammals and herpes to fauna. The other associated activities like clearance of vegetation will have impact on noise etc.
- Stunted *Acacia leucophloea* (Harmo baval), *A. nilotica* (Baval), *Prosopis cineraria* (Khijado) were seen intermixed with *Azadirachta indica*, *ziziphus* spp. It is mostly invaded by *Prosopis juliflora* (Gando baval). Invasion is a threat to the local habitat. It is biologically controlled community existing in a severely degraded state.
- The villages of the focused areas (project affected areas) usually practice agricultural activities and also involve in animal husbandry. There will not be impact on the livestock population as no grazing area is affected as a consequence of the proposed alignment. Animals graze in Farm inside every household. The ample pasture land is available for livestock population support. Further, dependency of the local people for their livelihood viz. food, fodder, medicine and shelter is marginal on existing forest wealth. The proposed land (RoW) will be used permanently for construction and laying of rail route; so, there will be loss of agricultural land in some patches.

4.11 SOCIO-ECONOMIC ENVIRONMENT

The following section presents socio-economic profile of the project affected Districts and project impacted area and also gives socio-economic analysis of the project affected households likely to be affected by the proposed HORC alignment. The socio-economic profile is based on 20% survey samples and the Impact assessment is based on Census survey data

4.11.1 Overview of Haryana State

Haryana is the land of rich culture and agricultural prosperity. It is located in India's north western region and surrounded by the state of Himachal Pradesh to the north, Uttarakhand to the northeast, Rajasthan to the south, Uttar Pradesh and Delhi to the east and Punjab to the northwest. Its area covers 1.3% of the

country area. It shares its capital city Chandigarh with the state of Punjab. Haryana has 22 districts with Gurgaon, Faridabad, Kamal, Panipat and Kurukshetra being the major ones. The state also has nine districts located within the Delhi National Capital Region, which is one of India's fastest growing economic regions.

According to India's 2011 census data, Haryana comprised 5.96% of India's population. It had a population of 25.35 million, of which 13.5 million were male while 11.85 million were women. From 2017 to 18, Haryana's literacy rate was 76.64 %, which was lower than the national average of 77.7%.

The official language of Haryana is Hindi. It is spoken in their niche dialect and accent making it sound different altogether. Haryana's GSDP grew at a Compound Annual Growth Rate (CAGR) of 12.66% between 2011 and 2012, as well as between 2017 and 2018, reaching an estimated US\$94.4 billion between 2017 and 2018. In the same period, it had a per capita income of US\$2,975.29, while its GSDP grew 11.6%, which was higher than India's overall GDP growth rate of 9.8%. From 2017 to 2018, Haryana contributed about 3.63% to India's economy.

Major industries in Haryana are automotive, IT, agriculture and petrochemicals. The state is most preferred by automotive and automotive component companies. It produces two-thirds of all passenger cars, 50% of all tractors and 60% of all motorcycles produced in India. Some of the well-known automotive companies located in Haryana include the Escorts Group, Hero Moto Corp Ltd, Maruti Suzuki India and Yamaha Motors. In addition, the state had been identified as a manufacturing hub by the national government. Agriculture, especially food grains, is also a key industry. From 2016 to 2017, Haryana accounted for seven percent of the country's agricultural exports and in the period 2017 to 2018, food grain production was 17.48 million tonnes. In the same period, it exported US\$1.3 billion worth of agricultural products.

The state has a great transportation system facilitated through various mediums such as roadways, metros, and local transports systems. The state has a unique railway system such as Western Dedicated Freight Corridor, Eastern Dedicated Freight Corridor, and Diamond Quadrilateral High-Speed Rail Network. There are two railway zones in Haryana, the Bikaner zone and the northern railway zone. It eases out travelling activities from one city to another in Haryana. There are other railways that link the state to other cities like Delhi, Agra, etc. The socio-economic indicators of the five districts are given below in **Table 4.42**.

Table 4.42: Summary of Socio-economic Indicators

Indicators	Project Districts					State
	Palwal	Nuh	Gurugram	Jhajjar	Sonipat	
Geographical Area (sq km)	1,359	1507.00	1,258	1,834	2122	44,212
No. of Sub-Divisions	3	2	2	3	4	73
No. of Tehsils	3	4	5	5	4	93
No. of CD Blocks	6	5	5	4	8	140
No. of Gram Panchayats	237	307	210	250	322	6,222
No of Villages	282	439	242 (9 towns)	264	332	7356
No of Households	171,157	159,858	325,239	185,334	276,409	48,60,000
Total Population	1,042,708	1,089,263	1,514,432	958,405	1,450,001	25,351,462

Indicators	Project Districts					State
	Palwal	Nuh	Gurugram	Jhajjar	Sonipat	
Male Population	554,497	571,162	816,690	514,667	781299	13,494,734
Female Population	488,211	518,101	697,742	443,738	668,702	11,856,728
Children (age 0-6)	177,494	65,716	202,602	120,051	188,262	3,380,721
Density of Population per sq km	767	1,507	1,204	523	683	573
SC Population (%)	19.5	6.9	13.1	17.8	18.6	16.14
ST Population (%)	0.0	0.0	0.0	0.0	0.0	0.0
BPL (%)	0.9	2.2	0.9	0.9	1.6	11
Sex Ratio (No. of females per 1000 male)	880	907	854	862	856	879
Literates (%)	69.32	54.08	84.7	80.65	79.12	75.55
Main workers (%)	21	19	32	26	27	27.67
Cultivators (%)	29.56	36	32	34	27	27.82
Agriculture Labourer (%)	19.6	19	12	14	19	17.14
Household Industries (%)	2.77	2	3	3	3	2.94
Other Workers (%)	48.07	43	53	49	50	52.1
Marginal Workers (%)	8.88	8	4	8	9	8
Non-Working (%)	70.31	73	64	66	64	64.83

Source: Haryana Census 2011

Amongst the five districts Sonipat has larger geographical area, 8 CD blocks, 322-gram panchayats, highest SC population, highest numbers of households, highest cultivators amongst the five Districts. Gurugram has highest population, literates, main workers, household industries amongst the five Districts. Nuh has highest population density and sex ratio amongst the five districts.

A general profile of these five districts is presented in this section.

PALWAL

Palwal is a city and a municipal council. Palwal is a center for the cotton trade in the area. Palwal district being part of National Capital Region (N.C.R.) and Haryana sub-region is proposed as a regional center in 2021. Palwal is 60 km from Delhi, 29 km from Faridabad, 313 km from Chandigarh and 143 km from Agra. The latitude of the town is 28° 40' N and longitude is 76° 59' E. The area of town is 22.10 sq. km. The city has an average elevation of 195 meters. Socio-economic indicators are given in Table 4.1.

NUH

Mewat District officially known as Nuh District. It has an area of 1,507 square kilometers and 10.9 million populations. It is bounded by Gurugram district on the north, Rewari district on the west and Faridabad and Palwal districts on the east. It is predominantly populated by the Meos, who are agriculturalists, and Muslims. The main occupation in the district is agriculture along with allied and agro-based activities. Agriculture is mostly rain-fed except in small pockets where canal irrigation is available. Animal husbandry, particularly dairy, is the secondary source of income for the people and those who live closer to the hilly ranges of Aravalli also kept sheep and goats. Socio-economic indicators are given in **Table 4.42**.

Kundli Manesar Palwal Expressway provides high speed access to district from Palwal and Manesar. Major District Roads 131 and 135 passing through district connects major town to Delhi-Agra Highway. There is no railway line and railway station in this district.

GURUGRAM

Gurugram District is the second largest city in the Indian State of Haryana and is the industrial and financial center of Haryana. It is one of the major satellite cities of Delhi and is part of the National Capital Region of India. It has the 3rd highest per capita income in India after Chandigarh and Mumbai. It is also the only Indian city to have successfully distributed electricity connections to all its households. It is also the IT hub & center of various BPO companies.

The city is home to several other companies that specialize in domain expertise. Siemens Industry Software, in Gurugram Business Park, made a portfolio of design software that was used by NASA to digitally design, simulate and assemble the vehicle before any physical prototypes were built. Various international companies, including Coca-Cola, Pepsi, BMW, Agilent Technologies, Hyundai have chosen Gurugram to be their Indian corporate headquarters. Socio-economic indicators are given in **Table 4.42**.

The area is well connected by roads and railways. National Highway No. 8 connecting Delhi with Jaipur passes through the district. Major state highways are - No. 13, No 28, No 26 and No. 15A connecting Gurugram - Alwar, Palwal - Sohna, Gurugram - Rewari -Narnaul- Singhana road and Jhajjar -Farrukhnagar-Gurugram respectively. Almost all the villages are connected by metalled roads. Northern Railway Broad gauge main line Delhi – Gurugram - Rewari and branch line Garhi- Harsaru-Farrukhanagar meter gauge branch line was constructed as far back as in 1883 for the salt traffic of that area. Manesar is an industrial town in Gurugram district of the State of Haryana and is a part of the National Capital Region(NCR) of Delhi.

JHAJJAR

Jhajjar district headquarter is situated 29 km from Delhi and had developed into an important of industrial center. The district lies between 28°22' and 28°49' N latitude and 76°18' and 76° 59' E longitude. The district is having an area of 1834 square kms which is 3.77 % of total area of the state. The average plain elevation of the District is about 222 meters above mean sea level. Socio-economic indicators are given in **Table 4.42**.

Agriculture, Livestock rearing is important activities. Many of the industries in this district are engaged in production of materials used in building and construction sector. Thermal power plants are generating electricity. Infrastructure development fosters growth of tertiary sector industry. Special Economic Zone has been proposed along the National Highway passing through this district for industrial development. Bahadurgarh is the major industrial estate of the district. Bahadurgarh alone covers 3,000 industries out of 3,300 total industries in district. Basic industries are ceramics, glass, chemicals, engineering, electrical and electronics.

Jhajjar Railway station consists of eight platforms. The station lies on Rewari-Rohtak line. A new 75 km long railway line was constructed between AsthalBohar station that lies on Rohtal-Delhi railway line and Rewari via Jhajjar.

SONIPAT

Sonipat is located at 28.98°N 77.02°E. It comes under the National Capital Region and is around 43 km (27 mi) from Delhi. Topographically Sonipat district is divided into three regions - Khadar, Upland Plain and Sandy Region. Sonipat city is lying on upland plains, which is covered with old alluvium, which if properly irrigated, is highly productive. Extensive farming of crops, oilseeds, horticultural plants, vegetables and flowers, is undertaken in this region. Sonipat District has fine loamy soil with rich colour. However, some areas have sandy soil.

There are two (Haryana State Industrial and Infrastructure Development Corporation) HSIIDC industrial estates, one each at Sonipat city and Kundli. Sonipat has four industrial areas (Sonipat, Kundli, Rai, Bari) which contain numerous small- and medium-scale industries. Atlas, E.C.E. or the Birla Factory, OSRAM India (formerly part of E.C.E., but in October 1998 it was acquired by OSRAM were few large-scale industries name which were in city (now they have been re-located to Rai/Kundli/bari industrial areas). Socio-economic indicators are given in **Table 4.42**.

Sonipat Junction Railway Station is located on the Northern Railways' Ambala- Panipat- Delhi rail route. It lies on one of the busiest railway lines in North India that is Delhi - Chandigarh. A number of passengers and express trains daily passes through it like Shatabadi Express, Shaan-e-Punjab, Malwa Express, Muri Express, Saryu Yamuna Express, Himalayan Queen, Sachkhand Express, Paschim Express, Kalka Mail, Jammu Mail, Unchahar Express, Amritsar Express, Jhelum Express, Tata Jat Express, Jan Shatabi, Shahid Express etc. Intotal, more than 64 trains are available from Sonipat daily. National Highway 1 and National Highway 71A pass through this district.

Socio-Economic Profile of Project Affected Households

The purpose of survey was to find out the details of likely affected persons including their number, social category, household size and occupational pattern. This profiling becomes important, as it helps in evaluating the positive as well as negative impacts due to the project on targeted population and communities. The following data would be updated at the verification stage.

The baseline and census survey collected a wide range of data including demography, ethnicity, religion, social stratification, loss of assets, present usage of structures, education, occupation, income, expenditure patterns, tenure/ownership, access to public amenities, preference for compensation etc. The database provides a detailed picture of the social and economic conditions and the likely impact that the people may have to sustain due to the project. Data revealed that due to development of proposed HORC project 9866 PAHs would be affected due to loss of land (19 residential and 1 tenant and 3 Kiosk) and 23 will be displaced due to loss of residence, commercial or other structures. The data collected through socio-economic survey generated demographic and socio-economic profile of project affected households. The data has been compiled and presented in tabular forms.

Demographic Profile-Gender

Table 4.43 shows that out of the total 43,908 PAPs, 24315 (55.4%) are male and 19,593 (44.6%) are female. Gender distribution in the society plays a vital role for different approach in development process. However,

the sex ratio of the affected Districts is 806 as revealed from the survey, which is much less than the State (879).

Table 4.43: Sex Distribution of Project Affected Persons

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
Male	9379	2509	6587	3404	2436	24315	55.4
Female	7688	1937	4997	2873	2098	19593	44.6
Total	17067	4446	11584	6277	4534	43908	100

Source: Field Survey data by OMTC Team, June 2021

Age of the PAPs

Age grouping of the population gives an idea about the productive group which influences the socio-economic condition of the families. Generally, the age group of 18-45 is considered as highly potential for the society as well as family. In this context, the age distribution of the affected population has been collected and presented in **Table 4.44**. The table indicates that highest 33.4% population belongs to the productive age group (19-35 years) whereas the second highest 30.1% are in the age group of 36-59 years who are also economically active group. Further, the age group between 0-14 years is 17.2.0%, 6.7% population falls in 15-18 years of age and 1% PAPs did not respond to the enquiry.

Table 4.44: Age Group of Project Affected Persons

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
0-14	2375	834	2117	1396	834	7556	17.2
15-18	897	276	972	520	265	2930	6.7
19-35	5596	1464	4058	2091	1440	14649	33.4
36-59	5599	1364	3218	1714	1322	13217	30.1
60 & above	2251	498	1166	543	649	5107	11.6
No response	349	10	53	13	24	449	1
Total	17067	4446	11584	6277	4534	43908	100

Source: Field Survey data by OMTC Team, June 2021

House hold Size

Table 4.45 gives the average District wise size of the households. Maximum size is found in Nuh District (5.6) followed by Palwal (5.2) and the minimum size is found in Jhajjar District. It can be seen that 62.8% of households have up to four members indicating dominance of nuclear households.

Table 4.45: District wise Size of the House Holds

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
Small (1-2)	675	383	220	212	338	1828	18.5
Small (3-4)	1817	684	825	445	612	4383	44.3
Medium (5-7)	1049	216	675	328	243	2511	25.4
Large (Above 7)	377	23	457	258	52	1167	11.8
Total	3918	1306	2177	1243	1245	9889	100
Average Size	4.7	3.7	5.6	5.2	3.8	4.6	

Source: Field Survey data by OMTIC Team, June 2021

Marital Status

Table 4.46 shows the marital status of the PAPs. Married PAPs are 26105 (59.5%) and whereas unmarried are 14904(33.9%). 179 (0.4) are divorced, while 1533 PAPs (2.7%) are Widow/Widower. 1187 (2.7%) PAPs did not give their response to their marital status.

Table 4.46: Marital status in Project Affected Households

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
Unmarried	4830	1717	4161	2585	1611	14904	33.9
Married	10789	2435	7016	3345	2520	26105	59.5
Divorced	51	20	22	20	66	179	0.4
Widow/Widower	685	155	183	294	216	1533	3.5
No response	712	119	202	33	121	1187	2.7
Total	17067	4446	11584	6277	4534	43908	100

Source: Field Survey data by OMTIC Team, June 2021

Religion of PAH

It is revealed from **Table 4.47** that out of the 9889 surveyed households 8989 (90.9%) PAH are Hindus and the remaining 900(9.1%) PAH are Muslim. Other religious category was not found in the HORC.

Table 4.47: Religion status of Project Affected Households

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						
Hindu	3915	1306	1480	1043	1245	8989	90.9
Muslim	3	0	697	200	0	900	9.1
Total	3918	1306	2177	1243	1245	9889	100

Source: Field Survey data by OMTC Team, June 2021

Social Stratification

The caste of a person not only reflects his social status but also his economic conditions. Generally, the higher castes people are well off and have a wide inter-linked network and the low castes like Scheduled Castes and Scheduled Tribes are weak, vulnerable and deprived in the society. They deserve particular attention in the misery mitigation programmes of the project. As per **Table 4.48**, majority of the PAH belong to general caste 5947(60.1%) followed by BC/OBC (creamy layer) i.e., 3118 (31.5%) PAH. There are 618 Households of BC/OBC (non creamy layer) i.e., (6.2%). Scheduled caste Households were 206(2.1%). It was also found that there are no scheduled tribe families in the surveyed area.

Table 4.48: Social Stratification of PAH

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
General	1841	1290	642	932	1242	5947	60.1
SC	125	0	34	47	0	206	2.1
ST	0	0	0	0	0	0	0
BC/OBC (Creamy layer)	1672	6	1191	247	2	3118	31.5
BC/OBC (Non- Creamy layer)	280	10	310	17	1	618	6.2
Others	0	0	0	0	0	0	0
Total	3918	1306	2177	1243	1245	9889	100

Source: Field Survey data by OMTC Team, June 2021

Education

Education has become a basic need in a modern society that enables a person to participate in the process of economic growth. In this context the study has analyzed the literacy level of the affected population as in **Table 4.49**, which shows that out of the total population of 43908, 6722(15.3%) are illiterate which

includes children not going to school. The highest percentage is of 17.1% is of those who have completed high school i.e., Class X, 16% of the PAPs are graduates.4.9% of PAPs did not respond to the enquiry.

Households Economic Activities & Livelihood

The economic condition of a family depends on its member's occupational pattern, employment and number of earners in the family. Occupation of the head of a project affected family influences that of its other members.

The main occupations of the PAPs have been collected and it has been revealed that 13119 numbers of PAPs (29.9%) are engaged in Agriculture. 6129 PAPs (14%) are working in Household/cottage industry. Whereas 2285(5.2%) PAPs are in Private services. 991(2.3%) are in Government service. 10838(24.7%) of PAPs are too young to work or disabled or are Students.3647 (8.3%) PAPs did not respond.

Households Earning and Dependent Members

Table 4.51 shows district wise number of earning members in project affected households. Maximum earning members are found in Gurugram District (2885) followed by Nuh District. Minimum earning members are observed in Sonipat District. 14.1 % of household gave no response to this query.

Table 4.49: Education status of Project Affected Persons

District	Gurugram			Jhajjar			Nuh			Palwal			Sonipat			Total	Percentage
	Number																
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T		
Illiterate	738	1456	2194	280	387	667	858	1148	2006	427	935	1362	142	351	493	6722	15.3
Below class VIII	824	810	1634	401	373	774	743	718	1461	465	438	903	368	329	697	5469	12.5
VIII Pass	625	628	1253	172	140	312	475	676	1151	377	310	687	152	124	276	3679	8.4
Below Class X	1030	1119	2149	298	176	474	930	730	1660	465	268	733	458	332	790	5806	13.2
Completed Class X	1969	1121	3090	476	314	790	1291	707	1998	512	263	775	529	343	872	7525	17.1
Not completed College	1525	857	2382	344	200	544	878	411	1289	739	257	996	183	115	298	5509	12.5
Finished graduate or higher	1909	1122	3031	468	289	757	1195	443	1638	331	365	696	519	395	914	7036	16.0
No response	759	575	1334	70	58	128	217	164	381	88	37	125	85	109	194	2162	4.9
Sub-Total	9379	7688	17067	2509	1937	4446	6587	4997	11584	3404	2873	6277	2436	2098	4534	43908	100.0

Source: Field Survey data by OMTC Team, June 2021

M=Male, F=Female, T= Total

Table 4.50: Occupation of Project Affected Persons

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
Agriculture	6698	1042	3118	1372	889	13119	29.9
Allied Agriculture	38	40	291	7	140	516	1.2
Dairy	65	21	51	10	60	207	0.5
Forestry	7	21	39	3	13	83	0.2
Household/Cottage Industry	2750	7	2872	488	12	6129	14
Business/Trader/Shop Owner	352	41	229	76	31	729	1.7
Skilled Profession	36	9	64	29	18	156	0.4
Unskilled Labor	28	1	13	31	47	120	0.3
Pvt. Service	537	202	689	573	284	2285	5.2
Govt. Service	289	188	177	83	254	991	2.3
Retired/Pensioner	134	139	68	116	251	708	1.6
Unemployed but capable to work	111	170	48	173	142	644	1.5
Too Young to work/ / Student	3133	1079	3463	2115	1048	10838	24.7
Others	857	936	69	1019	855	3736	8.5
No response	2032	550	393	182	490	3647	8.3
Total	17067	4446	11584	6277	4534	43908	100
Source: Field Survey data by OMTC Team, June 2021							

Table 4.51: Number of Earning Members in PAH

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
1 to 2 members	2634	1234	1655	957	1056	7536	76.2
3 to 4 members	231	30	314	210	94	879	8.9
5 members and above	20	4	39	7	8	78	0.8
Sub Total	2885	1268	2008	1174	1158	8493	85.9
No Response	1033	38	169	69	87	1396	14.1
Total	3918	1306	2177	1243	1245	9889	100

Source: Field Survey data by OMTC Team, June 2021

Table 4.52 shows district wise number of Dependent members in project affected households. Maximum dependent members are found in Gurugram District (3603) followed by Nuh District (2096). Minimum earning members are observed in Sonipat District (1085). 8.9% of household have no dependent members.

Table 4.52: District wise Number of Dependent Members in PAH

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
1 to 2 members	975	547	449	270	537	2778	28.1
3 to 4 members	1764	518	990	506	467	4245	42.9
5 members and above	864	65	657	321	81	1988	20.1
Sub Total	3603	1130	2096	1097	1085	9011	91.1
Not dependent	315	176	81	146	160	878	8.9
Total	3918	1306	2177	1243	1245	9889	100

Source: Field Survey data by OMTC Team, June 2021

Household Income& Expenditure

The finding of the survey revealed that the highest monthly income of Rs.27,377.5 of PAHs is in Gurugram District, shown in **Table 4.53** followed by Palwal and Sonipat. The lowest income per month is of PAHs in Jhajjar District. Thus, proper attention should be given while preparing the social impact management plan to extend the help poor PAHs. Amongst 12091 PAFs 34.7% earn upto Rs 10,000 (BPL).

Table 4.53: Monthly Income of the Project Affected Households

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
Rs. <5000	96	615	48	96	453	1308	10.5
Rs.5001-10,000	869	325	864	397	429	2884	23
Rs.10001-20000	1665	247	1843	835	234	4824	39.8
Rs.20001-30000	1030	121	201	329	119	1800	15
Rs.30001-40000	331	89	125	103	58	706	6
Rs.40001-50000	115	82	36	48	79	360	3
Rs. >50000	61	62	6	16	64	209	3
Total	4167	1541	3123	1824	1436	12091	100
Average monthly income (Rs.)	27377.5	15840.6	16968.8	19092	19050	20691.1	

Source: Field Survey data by OMTTC Team, June 2021

Household's expenditure on different items is constrained by its income and collection of expenditure data is equally important as income for assessment of the household's standard living. Income data were felt to be an underestimate as the respondents apprehended this might affect their BPL status. Thus, previous year's average monthly expenditure pattern on food and non-food items were analyzed to establish co-relation between the income and expenditure. The **Table-4.54** shows the monthly expenditure pattern of the affected Families.

Table 4.54: Monthly Average Expenditure of the Households

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat
	In Rupees				
Food	5995.6	4385.2	6644.1	9677.6	4356
Cooking fuel	1200.4	2148.8	1346.2	1175.6	804.3
Rent	4340	1449.8	5363.6	3833.3	500
Water bill	369.3	294.9	320.3	567.2	263.3
Electricity bill	1449.5	1195.1	1290.4	1597.8	909.8
Travel	2062	1509.2	1717.5	3293.9	938.9
Education	2242.2	3473.8	1652	2508.5	2822.3
Health	1427.1	1588.7	669.2	2272	1130.7

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat
	In Rupees				
Clothing	1083.8	1533	1294	1370.6	2633.5
Loan repayment	6680.8	1207.7	9430	17611.1	3840.6
Others	13926.8	10616.7	4368.4	13500	7150
Agriculture Expenditure (seeds, fertilizer, labour, irrigation, etc)	2578.8	2413.3	3632.2	2500	3914.5
Total	14517.3	14647.4	18645.4	20381.8	12347.1
Source: Field Survey data by OMTIC Team, June 2021					

The average monthly expenditure of the PAFs shows that in Nuh District the average expenditure of families is around Rs. 20,400/- per month on food items and other range of expenditure on food items are quite low. District Sonipat PAFs show lowest expenditure of Rs 12,350.

Basic Amenities & Assets

Availability of basic amenities of a household reflects wellbeing and ownership of a household adds to the social status of a person. Thus, the amenities availed by the project impacted households were observed and noted during the survey.

Civic Facilities

The civic facilities of the affected households revealed that almost all the households have electricity connection which is the most important requirement of the modern life. About 98% of households have constructed separate sheds for animals. Bathrooms within the house are available in 98% households and 100% of households have separate washing platform. Similarly, all households (100%) have toilet within the house. From the above analysis it has been observed that all basic civic amenities are available in most of the houses of the affected households and are in well-to do condition. The **Table 4.55** depicts the percentage distribution of different facilities of the affected households.

Drinking water

During the field survey information was collected on the source of drinking water for the affected families and multiple responses have been noticed, the data reveals that 45% of PAH are depending on pipe water for drinking purpose throughout the year and 25% of the PAH rely on open well where as 30% families are using tube well water.

Assets

From the **Table 4.55** it has seen that all affected families almost all have television and 98% have Refrigerator in their house. All have mobile phones and all have electricity connections. 98% have LPG gas connection as cooking fuel. Apart from, it is also found that some higher income group households have four wheelers (34%) and 25% have two wheelers.

Table 4.55: Basic Amenities and Assets for PAH

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	Percentage
	Number						%
Separate Place for Animal	3838	1289	2134	1214	1218	9693	98
Bathroom within house	3840	1292	2135	1217	1219	9703	98
Toilet within house	3918	1306	2177	1243	1245	9889	100
Washing Place within House	3918	1306	2177	1243	1245	9889	100
Kitchen	3918	1306	2177	1243	1245	9889	100
Well	958	321	536	304	307	2426	25
Pipe water	1764	589	978	558	560	4449	45
Tube well	1176	392	652	373	375	2968	30
Tv	3918	1306	2177	1243	1245	9889	100
Refrigerator	3842	1291	2135	1218	1220	9706	98
Telephone/mobile	3918	1306	2177	1243	1245	9889	100
Cooking Gas	3838	1289	2134	1214	1218	9693	98
Two-Wheeler	959	322	534	302	305	2425	25
Four- Wheeler	1344	450	748	425	426	3393	34
Other Appliances	2111	709	1172	668	671	5331	54
Electricity Connection	3918	1306	2177	1243	1245	9889	100
Source: Field Survey data by OMTC Team, June 2021							

Decision Making and Participation

To focus the women empowerment in the affected villages gender-based decision making and participation at household level activities have been assessed. In this context the role of male and female members on decision making have been asked to the respondent. The **Table 4.56** presents the views of respondents about decision making and participation. The data reveals that almost all the surveyed households, decisions are made mostly by male members of the Household. Jointly both male and female members take decisions regarding family issues. Women have major decision in social functions and marriages i.e., 45%. Regarding Land and property decisions are done by male of the house(68%) which clearly highlights significant disparity and more reason why gender considerations should be included.

Table 4.56: Gender Decision Making & Participation

District	Decision Maker	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	% of Total PAF(12091)
		Percentage					
Financial Matter	Male	21	12	13	10	9	65
	Female	7	3	4	2	1	17
	Both	6	5	4	1	2	18
Education of child	Male	15	12	11	9	8	55
	Female	9	4	7	3	2	25
	Both	6	4	5	3	2	20
Health care of child	Male	16	11	14	8	7	56
	Female	7	4	6	2	3	22
	Both	6	5	6	3	2	22
Purchase of assets	Male	17	13	15	8	7	60
	Female	6	5	4	2	1	18
	Both	6	5	6	3	2	22
Day to day HH activities	Male	13	9	10	8	8	48
	Female	12	5	8	4	3	32
	Both	7	3	6	2	2	20
Social Functions and Marriages	Male	14	4	7	5	4	34
	Female	12	8	9	7	9	45
	Both	6	4	5	3	3	21
Land and property	Male	19	15	17	9	8	68
	Female	7	3	6	4	2	22
	Both	4	2	2	1	1	10
Source: Field Survey data by OMTC Team, June 2021							

Access to Public Facilities

During the process of data collection information was collected on access to various service facilities by the affected families. As per the findings 3645 HH stated that primary school is accessible by the children of all the affected HH since it is located in close proximity. The secondary school and college are also accessible within the distance of 1.0 km as stated by the affected HH. From the **Table 4.57** it is observed that the common facilities are accessible within 3km except hospital and block office as stated by the respondents.

Table 4.57: Access to Public service facilities

Facilities	Up to 1km	Up to 2km	Up to 3km	More than 3km	Total
	Number of House Hold				
Primary School	3000	3645	2267	977	9889
Secondary School	2481	2865	3201	1342	9889
college	674	1246	2817	5152	9889
Regular Market	784	1346	2464	5295	9889
Hospital	1256	2345	2929	3359	9889
Block Office	1225	3067	3334	2263	9889
Panchayat Office	1238	2733	2895	3023	9889
Source: Field Survey data by OMTC Team, June 2021					

Perceived benefits about HORC project

Table 4.58 shows the awareness amongst the project impacted households it was noted that only 9.7% of PAHs were aware about the proposed rail project through Television and newspaper (5.0%) and other source of information (4.7%) and 90.3% PAHs did not respond to the enquiry.

Table 4.58 Perceived benefits about HORC project

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	%
Awareness about the project in PAH							
Yes	3918	1306	2177	1243	1245	9889	100
Total	3918	1306	2177	1243	1245	9889	100
Source of information							
Newspaper	127	107	75	59	124	492	5.0
Villagers	55	34	46	32	35	202	2.0
Govt. officials	56	69	49	27	50	251	2.5
Others	5	3	1	4	6	19	0.2
No response	3675	1093	2006	1121	1030	8925	90.3
Total	3918	1306	2177	1243	1245	9889	100
Households Reporting Positive Impacts							
Increased employment opportunity	650	312	145	187	167	1461	14.8
Speedy movement of people	1665	589	782	291	489	3816	38.6

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	%
Increase in business opportunity	978	156	617	278	189	2218	22.4
Increase in land price	377	26	434	223	137	1197	12.1
Improved access to cities	10	12	15	134	23	194	2.0
Others	2	11	14	10	16	53	0.5
Households Reporting Negative Impacts							
Loss of income	119	98	51	47	101	416	4.2
Pressure on existing infrastructure	45	56	47	25	86	259	2.6
More visitors/population	43	29	43	32	14	161	1.6
Conflict with outsiders	24	15	26	15	15	95	1.0
Others	5	2	3	1	8	19	0.2
Total	3918	1306	2177	1243	1245	9889	100
Source: Field Survey data by OMTC Team, June 2021							

Positive and negative impacts of the proposed project were outlined and reported by the participants during discussions in census socio-economic survey. About 38.5% of PAHs consider speed movement of people as a positive benefit of this project followed by 22.4% and 15% who consider business opportunity and employment opportunity respectively. About 4.2% PAHs consider that there could be loss of income and 3% are of the opinion that this project will have pressure on existing facilities.

Rehabilitation and Resettlement options

Table 4.59 shows that about majority of surveyed households 58.0% are willing to shift due to the proposed project. 37.8% of surveyed households do not want to shift to a new structure. And about 4.3% households did not respond because they were reluctant to answer this question. Talking about mode of relocation majority of surveyed households 91.6% has preferred self relocation, 8.4% households have opted project affected relocation and 10.2% gave no response. Compensation Option for those losing land 3.8% opted for land for land, 90.1% wanted cash for land and 6% gave no response. When asked for an option for loss of Structure .9% preferred structure for structure, 12.9% preferred cash for Structure while 87% gave no response. For income restoration assistance, majority of surveyed households (47.8%) have preferred for employment opportunity followed by 25.9% of households preferring Assistance/loan from other ongoing development scheme while 16.4% wanted vocational training.

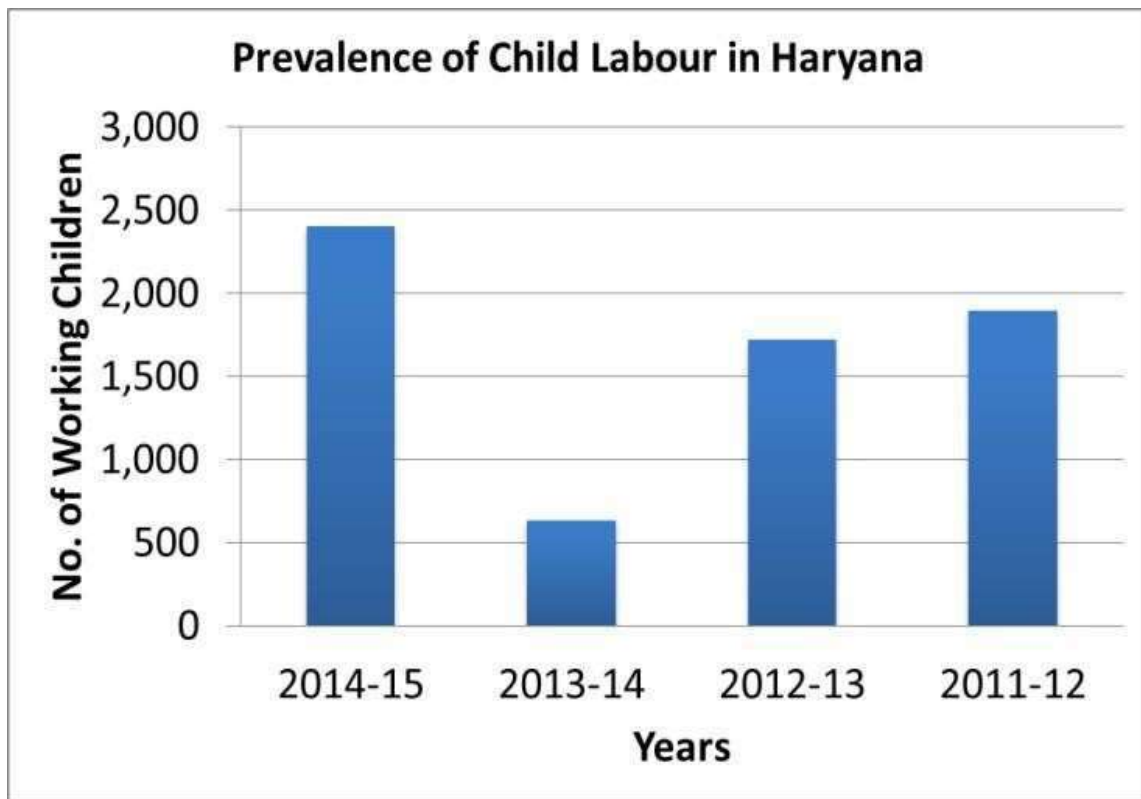
Table 4.59: District Wise Resettlement and Rehabilitation option

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	
	%	%	%	%	%	N	%
Willing to Shift							
Yes	60.5	1.6	90.8	85.6	24.3	5733	58
No	36.1	97	8.5	4.5	65.4	3735	37.8

District	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total	
	%	%	%	%	%	N	%
No response	3.5	1.4	0.7	9.9	10.4	421	4.3
Total	100	100	100	100	100	9889	100
Preference for mode of Relocation							
Self-Relocation	91.1	91.5	90.8	91.3	93.3	5254	91.6
Project Assisted Relocation	8.9	8.5	9.2	8.7	6.7	482	8.4
Total	100	100	100	100	100	5736	100
Compensation Option for those losing land							
Land for land	3.3	0.4	6.3	4.2	4.4	380	3.8
Cash for land	90.5	95.6	89.5	91.9	82.4	8911	90.1
No response	6.2	4	4.1	3.9	13.2	598	6
Total	100	100	100	100	100	9889	100
Compensation Options for those losing Structures							
Structure for structure	1.1	0	0.7	1.5	0.8	89	0.9
Cash for Structure lost	15.9	6.3	12.4	1.4	16.9	1201	12.1
No response	83	93.7	86.9	97.1	82.3	8599	87
Total	100	100	100	100	100	9889	100
Income Restoration Assistance							
Employment opportunities in construction work	54.3	46.8	48.4	49.3	38.2	4727	47.8
Assistance/loan from other ongoing development scheme	22.3	28.5	28.5	24.6	25.8	2565	25.9
Vocational training	12.9	16.4	15.6	17.4	19.5	1618	16.4
Others	5.7	7.3	5.8	7.6	10.4	728	7.4
No response	4.8	1	0.7	0.1	6.1	251	2.5
Total	100	100	100	100	100	9889	100
Source: Field Survey data by OMTC Team, June 2021							

Child Labour

In Haryana, the employment of children, however, in non-hazardous areas is rampant. Not only does child labour take away from children the opportunity to study and play, it gives rise to incidences of inequality, abuse of children, and health issues due to exertion and maltreatment. Presence of child labour is the violation of the child labour laws as well as the lack of implementation of primary education or Sarva Shiksha Abhiyan. The year wise child labour data is presented in **Figure 4.20**.



Source: Kanu Raheja, IJSR, Volume 5, Issue 6, June 2015.

Figure 4.20: Child Labour in Haryana

Creation of awareness at a grass roots level by educating village leaders and parents is important, especially about the necessity of sending girl children to school. The state is in need of massive awareness drives, in partnership with media and NGOs to instill the sanctity of childhood development and healthy growth of children. Schemes that have failed to curb child labour need to be immediately rethought and replaced with effective measures. No child labor was found during the survey on HORC.

Tribal People

Haryana state has no Scheduled tribe population and none was found during the census survey along the HORC.

Plate 4.2: Photographs of Water Sample Collection



Surface water sample collection near village Chapraulla



Surface water sample collection Near village Mandhoti



Surface water sample collection Near village Rohat



Ground water sample collection at Ashoda



Ground water sample collection at Kharkhoda

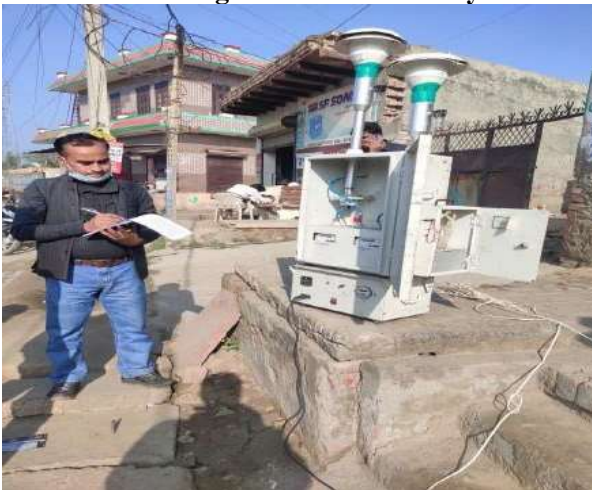
Plate 4.3: Photographs of Air Monitoring (For the Month of December 2020)



Air Monitoring at Pirthala Railway station



Air Monitoring Near village Sultanpur



Air Monitoring at village Ashoda



Air Monitoring at village Hasrana Kalan



Air Monitoring at Kharkhoda Town



Air Monitoring at village Mandhoti



Air Monitoring at Fazalwas Panchayat



Air Monitoring at Maneshar



Air Monitoring at village Khedi Kankkar



Air Monitoring at Farukhnagar Town

Plate 4.4: Photographs of Air Monitoring (For the Month of January, 2021)



Air Monitoring Near village Sultanpur



Air Monitoring at village Ashoda



Air Monitoring at village Hasrana Kalan



Air Monitoring at Kharkhoda Town



Air Monitoring at village Mandhoti



Air Monitoring at Fazalwas Panchayat



Air Monitoring at Maneshar



Air Monitoring at Farukhnagar Town

Plate 4.5: Photographs of Air Monitoring (For the Month of February, 2021)



Air Monitoring at Fazalwas



Air Monitoring at village Mandhoti



Air Monitoring at Kharkhoda Town



Air Monitoring at village Ashoda



Air Monitoring at Farukhnagar Town



Air Monitoring at village Khedi Kankkar



Air Monitoring Near village Sultanpur

Plate 4.6: Plant Diversity of Study Area



Ailanthus excelsa



Holoptelea integrifolia



Acacia nilotica



Aegle marmelos



Melia azedarach



Prosopis sp.



Datura sp.



Abutilon indicum



Calotropis procera



Ricinus communis



Chenopodium album



Tribulus terrestris

Plate 4.7: Photographs of Mammals of study area



Blue bull



Mongoose



Hanuman Langur



Monkey

Plate 4.8: Photographs of Avi-fauna of Study Area



White Throated Kingfisher



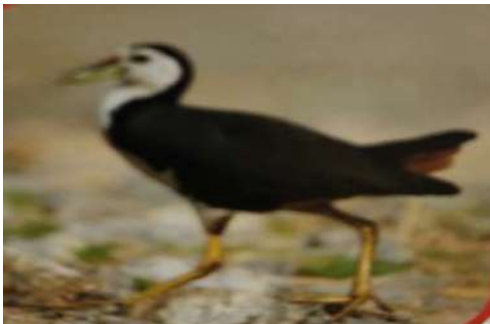
Coot



Painted stock



White wagtail



White Breasted Waterhen



Indian Peafowl



Common myna



Rock Pigeon

Plate 4.9: Agriculture Field and Forest of Study Area



Forest Area



Sarson field



Wheat Field



Brinjal Field



Cabbage Field

CHAPTER – 5

EVALUATION OF ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

5.1 BACKGROUND

On the basis of project details and baseline environmental and social status, this chapter identifies and assesses various potential impacts as a result of the pre- construction activities, construction and operation of the proposed HORC project. Study of initial field survey reports, details of existing baseline environmental and social conditions and reviewing the process and related statutory norms, major impacts were identified and assessed for design, construction and operation phases. The potential impacts have been assessed and predicted. Most of the impacts occur during pre-construction, construction and operation phase are temporary except a few, which are long lasting or permanent. The negative impacts are for short duration and lasts till the construction phase only while the benefits during the operation phase are everlasting. Proposed project will provide better opportunities for business & employment and accessibility to destinations.

5.2 ENVIRONMENTAL IMPACTS DURING PRE-CONSTRUCTION STAGE

- Change of Land use:
- Clearing the Ground for Construction Activity;
- Establishment of Labour Camps;
- Setting of Ready Mix Concreting (RMC) plant;
- Utility/Drainage Problems;
- Access Control and Barricading;
- Impact on Archaeological Monuments and Heritage Assets.

5.2.1 Change of Land Use

The factors which are decided at stages of design are the project location, alignment, right of way at-grade or otherwise, section of the viaduct and proposed utilities. By virtue of its location, alignment not passes through ecologically sensitive area or poses obstruction to birds in flight and can disturb birds.

The total permanent land required for the project development will be about 655.92 ha, out of this 558.25 ha is private land and 97.67 ha is government land of HSIIDC, DFCCIL and railway. Temporary land required will be government land.

5.2.2 Clearing the Ground for Construction Activity

Before construction, site is required to be cleared. It involves the removal of trees, grasses, shrubs. Shrubs and grass removed in ground clearing will be utilized in laying bottom layers of the earth work to minimize the impact during construction. Detail of the trees to be felled is given in **Table 5.1**.

Table 5.1: Trees to be Felled (Within RoW)

Name of district	Name of tehsil	Name of village	Number of trees to be cut	From Chainage (M)	To Chainage (M)		
Palwal	Palwal	Prithla	18	-2000	-1476		
		Chhaprola	25	-1307	2460		
		Dehlaka	5	3380	3400		
		Paroli	8	4220	4540		
Gurugram	Sohna	Ratikanoabad	3	6530	6530		
		Khuntपुर	12	6770	8010		
		Silani	8	8500	8690		
		Karanki	34	11110	11590		
Nuh	Nuh	Bhirawati	13	11810	12040		
Gurugram	Sohna	Sancholi	11	12160	12300		
Nuh	Nuh	Atta	7	15000	15550		
		Indri	2	15880	16720		
		Khanpur	9	17770	18190		
		Kherli kankar	16	21000	21700		
		Rupaheri	5	23080	23200		
		Rojka meo	12	24140	24180		
	Tauru	Sehsaula	3	27750	27760		
		Maindla	37	28000	28550		
		Dhulawat	76	28610	30190		
		Bidhuwas	68	30360	30610		
		Padheni	12	31110	32570		
		Gogjaka	2	33200			
		Goela	254	33390	34840		
		Deengarheri	32	34900	36110		
		Sabras	139	36470	38110		
		Kalwari	40	38880	41000		
		Gurugram	Manesar	Udepuri	8	41400	41660
				Chandla dungarwas	46	43330	44240
Fazalwas	94			44650	45170		
Kukrola	61			45490	46140		
Fakharpur	12			46190	46630		
Kasan	5			46790	46930		
Mokalwas	136			47130	47820		
Kasan	14			48100	49330		
F. Nagar	Jhund Sarai Abad		1803	49330	53600		
	Patli hajipur		151	53670	54070		
	Khentawas		149	55900	58650		
	Khentawas		10	58850	59180		
	Sultanpur		23	61590	64290		
	Jhanjrola		4	64600	65470		
Jhajjar	Badli	Mubarikpur	4	65560	66350		
		Mundakhera	12	67100	69570		
		Ismilpur	1	69570			
		Dewarkhana	1	69890			

Name of district	Name of tehsil	Name of village	Number of trees to be cut	From Chainage (M)	To Chainage (M)	
		Lagarpur	4	70150	71400	
		Badli	9	72100	72510	
		Daryapur	24	73130	74190	
		Badli	149	74710	78050	
		Majri	4	78700	79000	
	Bahadurgarh	Bupania	27	80000	83690	
		Dabodha khurd	18	84680	86380	
		Mehandipur	1	87730		
		Mandothi	43	88010	93350	
		Jakhoda	40	93450	93500	
			35	93550	93610	
		Asaudha todran	101	94110	98190	
		Jasour kheri	43	98470	100000	
		Kheri jasour	14	100100	101730	
	Nilothi	23	101930	102250		
	Sonipat	Kharkhoda	Kirauli	12	102650	103000
			Pai	8	105010	105010
			Prahladpur	140	105150	105450
Barona			81	105940	106800	
Gopalpur			146	106800	1080800	
Pipli			657	1090090	111950	
Thana kalan			658	112570	113700	
Turakpur			13	113900	114730	
Turakpur			3	115110		
Mandora			206	115570	118900	
Sonipat		Nahra	2	119300		
		Mahla majra	15	119690	120520	
		Chhatehra bhadurpur	59	121050	121600	
		Mahla majra	6	121760		
Rai		Akbarpur barota	12	122590	123410	
Sonipat		Jagdishpur	262	124200	126500	
		Nasirpur bangar	178	127100		
		Harsana khurd	62	127000	127500	
		Harsana kalan	59	127670	128000	
Total			6499			

About 21.4232 ha of forest area are likely to be affected by the project which falls under the category of protected forest (Table 5.2). In this forest area, railway, road and canal plantation are considered under protected forest.

Table 5.2: Chainage –wise Details of Forest Land (in Ha) in HORC Project

Palwal		Nuh		Gurugram		Jhajjar		Sonipat		Grand Total (in Hect.)
Chainage (M)	Area (Ha)	Chainage (M)	Area (Ha)	Chainage (M)	Area (Ha)	Chainage (M)	Area (Ha)	Chainage (M)	Area (Ha)	
-1.501	0.5980	19+900	0.5383	6+000 to 6+400	2.7898	64+300	0.0427	99+760	0.0720	21.4232
-0.317	0.0921	21+440	0.1056	7+342	0.1709	65+000	0.1491	101+382	0.0138	
1+000	0.0772	23+000	0.5383	7+642	0.1766	66+600	0.3217	111+900	0.1750	
1+750	0.0524	Tunnel	7.5890	7+078	0.2441	70+500	0.1755	112+500	0.0090	
2+796	0.0191	27+000	0.4806	10+024	0.0272	71+300	0.0103	115.5000	0.2350	
3+685	0.0035	30+006	0.3405	10+858	0.1661	74+600	0.3066	116+500	0.0714	
		31+114	0.0156	11+620	0.1710	79+100	0.1177	117+900	0.0780	
		31+939	0.0242	44+100	0.0028	80+000	0.1274	119+900	0.0338	
		33+073	0.0145	44+640	0.0708	81+400	0.1436	120+100	0.0430	
				46+200	0.6752	83+000	0.0907	123+300	0.0243	
				52+500	2.0727	86+080	0.1289			
				54+500	0.0805	86+500	0.2476			
				55+930	0.0282	91+200	0.0295			
				58+450	0.0066	91+400	0.0688			
				58+450	0.0234	91+600	0.1975			
				58+500	0.0363	94+900	0.0912			
						96+050	0.1038			
						96+100	1.0842			
Total	0.8423		9.6466		6.7422		3.4368		0.7553	

Source: HRIDC

5.2.3 Establishment of Labour Camps

Labour camps will be set up by the contractors as per the BOCWA. The labour camps will be setup by the contractors at suitable locations as per the construction site. Facilities such as shelter at workplace, canteen, first aid and day crèche are statutory requirement that need to be provided by the contractors along with the drinking and sanitation facilities.

Construction workers are more prone to infectious diseases due to unsafe sexual activity and lack of sanitation facilities (water supply and human waste disposal) and insect vectors. Improper disposal of municipal solid waste generated by labor camps can pollute surface water bodies and groundwater. Burning of waste can cause air pollution. Problems could arise due to cultural differences between workers from outside and local residents.

It is estimated that about 720 persons are likely to work during peak construction activity. Hence total population in labour in camps with a family size of 4 will be 2880. The estimated water requirement in the labour camps comes out to be about 388.80 KLD. Estimated quantities of wastewater and solid waste generated from labour camps is about 311.04 KLD and 288.00 Kg per day respectively. To minimize the impact from the labour camp sanitation facilities, solid waste storage bins and adequate drinking water arrangement will be provided by contractor during the entire construction period. According to the rules safe disposal of the waste will be complied by the contractor.

5.2.4 Setting up the Ready Mix Concrete plants

Batch plants for Ready Mix Concrete will be set up at the construction sites considering requirement of the project. The site selection for setting up Ready Mix Concrete plant should be as per the Guidelines for Ready Mix Concrete Plant (RMC) issued by Haryana Pollution Control Board. The RMC plant shall be set up away from sensitive locations such schools, colleges, hospitals and habitations as prescribed in the guidelines. The RMC plant requires 'Consent to Establish' and 'Consent to Operate' from the Haryana Pollution Control Board with necessary measures to control Air, Water and Noise pollution. HRIDC will facilitate the Contractors with necessary information to obtain the Consent for RMC plants.

5.2.5 Utility/Drainage problems

The proposed HORC project is planned to run mainly parallel to KMP expressway, DFCCIL alignment and existing railways track. Some sub-surface, surface and overhead utility services viz. sewers, water mains, storm water drains, gas pipe lines, telephone/communication cables, overhead power transmission lines, power cables etc. exists all along the proposed alignment. These utilities/services are essential and must be maintained in working order during different stages of construction by temporary/permanent diversions or by supporting in position. Also, suitable spanning arrangement need to be adopted to avoid locating foundation at utility location. It is essential to ensure that no existing utilities in the vicinity of the sites are affected by any of the project activities.

5.2.7 Access Control and Barricading

Access control and barricading will be provided for safety and prevention of entry of unauthorized persons on construction sites. Barricading will be required between existing and proposed railway line and also between construction site and residential/commercial structures near the site. The side of excavation/foundation shall be supported by sheet piling or bracing to guard against danger of workers falling or dislodgement of earth, rock or other material.

To the maximum possible extent, embankment will be used as approach road for vehicle used in construction to reduce the need of construction of additional access roads.

5.2.8 Impacts Due To Power Infrastructure

Most of the impacts due to Traction substations and power lines from nearest Grid Sub Station of HVPNL will be temporary; however, most of the community and environmental impacts will be permanent. The impacts due to power infrastructure of the project are discussed as follows:-

A) Temporary Impact

- Clearance of vegetative area if any and regraded prior to the construction of substation and transmission line.
- Noise pollution and emission of airborne dust due to use of equipment's to excavate the area of the transmission towers, substation, pad and access road, concrete and gravel trucks that will haul in materials for the foundation, and tractor trailers to bring in the electrical equipment's.

- Possibility of short electrical outages in nearby areas due to interconnection of nearby transmission and/or distribution lines into the new substation.
- Soil erosion and storm water runoff may also occur during construction when the existing vegetation is removed during foundation excavation, temporarily exposing bare ground. The thick gravel pad that is laid down (within the fenced substation area) acts as an impermeable surface and increases runoff during rain events.

B) Permanent Impacts

Among the important and long-lasting impacts will be, change in land use pattern and habitat loss, changes to local aesthetics, electromagnetic fields, public safety, noise, and lighting. These potential impacts are discussed below:

1. Aesthetics

The overall aesthetic impact of a new substation is highly dependent on the size and location of the facility. In rural settings, local property owners may not object to the facilities' strong visual impact. Because of the height of some substation equipment and the necessary clearing around the transmission facilities, it can be difficult to reduce the visual impact of transmission substations.

Some people do not notice transmission lines or do not find them objectionable from an aesthetic perspective. To some, the lines or other utilities may be viewed as part of the infrastructure necessary to sustain our everyday lives and activities. The overall aesthetic effect of a transmission line is likely to be negative to most people, especially where proposed lines would cross natural landscapes and private properties. The tall steel structures may seem out of proportion and not compatible with agricultural landscapes.

2. Cultural Resources

Potential impacts to cultural resources could occur in two ways: 1) ground disturbing activities could result in the loss of or damage to archaeological artifacts or unmarked burial sites; or 2) the views and site lines to or from an important historical site could be adversely affected by the physical presence of a new substation/tower. However, impact on cultural resource is not anticipated in the project.

3. Electromagnetic Fields

The electric and magnetic field (EMF) levels within the fenced area of a substation can be much higher than the surrounding area. However, these EMF levels decrease rapidly with distance from the transformers and other electrical equipment. Most of the time, EMF levels drop to the same as surrounding background levels at a distance of 10 to 20 m from the electrical equipment.

Health concerns due to over exposure to EMF are often raised when a new transmission line is proposed. The research to date has uncovered only weak and inconsistent associations between exposures and human health. To date the research has not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease, nor a plausible biological mechanism by which exposure to EMF could cause disease.

4. Public Safety

There are also strict safety requirements for personnel assigned to work in substations. To maintain safe conditions for the general public, all substations are fenced and have gates that must be locked at all times. Appropriate signage must also be posted that shows the owner of the substation, the hazardous nature of the substation, and contact information.

The most significant risk of injury from any power line is the danger of electrical contact between an object on the ground and an energized conductor. Generally, there is less risk of contact with higher voltage lines as opposed to low-voltage lines due to the height of the conductors. When working near transmission lines, electrical contact can occur, even if direct physical contact is not made, because electricity can arc across an air gap.

5. Noise and Lighting

The noise produced by an operating substation can be quite loud to adjacent property owners. A constant humming or buzzing noise may be audible several hundred feet from the substation fence. The sound may be especially noticeable during night-time hours when ambient noise levels are lower. Light pollution may diminish enjoyment of the night time sky in rural areas. Substations may have lights that operate all night long to discourage vandalism and unauthorized individuals.

Vibration or humming noise can be noticeable and is most often associated with older transmission lines. The other types of sounds that are caused by transmission lines are sizzles, crackles, or hissing noises that occur during periods of high humidity. These are usually associated with high-voltage transmission lines and are very weather dependent. They are caused by the ionization of electricity in the moist air near the wires. Though this noise is audible to those very close to the transmission lines, it quickly dissipates with distance and is easily drowned out by typical background noises. Ionization in foggy conditions can also cause a corona, which is a luminous blue discharge of light usually where the wires connect to the insulators.

5.3 ENVIRONMENTAL IMPACTS DURING CONSTRUCTION STAGE

- Soil Erosion;
- Impact on geology;
- Construction of new bridges and culverts;
- Collection of construction material;
- Excavation, loading and unloading of construction material;
- Quarries and borrow area;
- Contamination of soil;
- Impact on water quality;
- Storage, handling and disposal of solid, hazardous and C& D waste;
- Risk due to natural hazard;
- Impact due to climate change;
- Operation of construction equipments;

- Vibration impacts and risk to existing buildings;
- Traffic diversion;
- Occupational health and safety of labour;
- Impacts due to tunnel construction.

5.3.1 Soil Erosion

Erosion of top-soil can be considered a moderate, direct and long-term negative impact resulting from the construction of project. The potential for soil erosion is high and pervasive during the construction stage. Starting with clearing and grubbing of trees, vegetation is stripped away, exposing raw soil.

The construction of new fill slopes also exposes large areas to erosion, if protection methods are not implemented. Finally, during the operation and maintenance phase, erosion can continue to occur in areas not vegetated. Fills are exposed to long-term exposure to water and wind. Although soil erosion occurs sporadically on railway corridors, the sites most affected are generally bridge end fills and over-steep banks.

Erosion problems may occur on newly constructed slopes and fills depending on soil type, angle of slope, height of slope and climatic factors like wind (direction, speed and frequency) and rain (intensity and duration). Since slope protection methods (re-vegetation or stone pitching) form part of good engineering practice and have been incorporated into the detailed design, erosion concerns should be minimized. However, failure to maintain soil erosion protection can reduce the security of embankments during the monsoon season.

5.3.2 Impact on Geology

Likely impact on the geological resources will occur from the extraction of materials (borrow of earth, ballast and aggregates). The aggregate and ballast will be procured from the authorized suppliers and prevalent rules will be followed for borrowing of soil, sand and aggregates. Hence, the impact on general geology of the region is insignificant. At the construction sites, no blasting is proposed except tunnel; therefore, there will be no added impact on the geology of the area.

5.3.3 Construction of new bridges and culverts

A number of major and minor bridges and culverts are planned for the project. Construction of new bridges involves excavation for the construction of the foundation and piers. If the residual spoil is not properly disposed of, increased sedimentation downstream of the bridge may take place during the monsoon.

During the construction period some amount of drainage alteration and downstream erosion/siltation is anticipated. Some of these alterations may be because of construction of temporary traffic detours/diversion. Except for these temporary works, in almost all cases there should be an improvement in the drainage characteristics of the surrounding area due to improved design and added culvert/ditch capacity. Changes in the drainage pattern due to embankment profile has not been discussed in specific cases, as the likely impact is not adverse and does not warrant mitigation (as the design itself takes care of cross-pavement drainage). New culverts are being incorporated in the project not only to prevent over-topping but also to maintain equal water distribution on either side of the railway track. In fact, the bridges

and culverts, as designed, are an automatic enhancement to the local environment (flooding, stagnation, scour, torrent run-off velocity– all would be reduced as a result of this project).

5.3.4 Collection of Construction Material

Various construction material such as soil, ballast, aggregates, cement, sand, rails, sleepers, etc will be required by the contractor. The excavations of earth from borrow areas will require cutting of the soil, which could lead to:

- Loss of productive soil/ land;
- Disruption in the drainage pattern;
- Ponding / water logging problem and;
- Increase in siltation rates.

All the construction material will be procured from the authorized quarries only. The contractor is required to submit location of the quarries, the material movement plan and borrow area management plan along with proposal including the environmental clearance taken by the sand miners and quarry operators as per existing rules for this activity.

Construction material such as aggregate and earth will be sourced from approved quarries such that environmental impacts as well as wastage of natural resources are minimized and mitigated. It is proposed that cement should be transported in Cement bulker which is used to transport cement in huge quantity from the manufacturer unit to the silos of the batching plant instead of transporting cement bags. It is the best method to transport cement as bulkers are airtight so it prevents the cement to get expose to the environment.

5.3.5 Excavation, Loading and Unloading of Construction Material

Air pollution occurs due to excavation, loading and unloading of construction materials, emissions from vehicles, construction equipment and DG sets etc. It also occurs at sites of muck disposal, debris disposal and casting yards. Trucks and cranes are required to transport civil construction material from casting yards and batching plants to construction site and between construction site and soil disposal site.

The Contractor shall take all necessary precautions to minimize fugitive dust emissions from construction activities involving excavation, grading, and clearing of land and disposal of waste. He shall not allow emissions of fugitive dust from any transport, handling, construction or storage activity to remain visible in atmosphere beyond the construction area.

Air Modelling for Construction

Prediction of PM, SO₂, NO_x & CO - GLC'S During Construction Phase of Proposed Stations using AERMOD View

The extra load on the atmosphere by way of releasing air pollutants like particulate matter (PM₁₀, PM_{2.5}), Sulphur dioxide (SO₂), oxides of nitrogen (NO_x), carbon monoxide (CO) from Diesel Generator sets and vehicles plying near the location for construction materials have been taken up to assess the impacts on its surroundings. Entry of pollutants into the atmosphere occurs in the form of gases or particles. Continuous mixing, transformation and trans-boundary transportation of air pollutants make air quality of a locality unpredictable.

Dispersion estimates are determined by using distribution equations and/or air quality models. Gaussian plume equation is simple and widely used to identify the variation of pollutant concentrations away from the center of the plume. This distribution equation determines ground level pollutant concentrations based on time-averaged atmospheric variables (e.g., temperature, wind speed). One of the Dispersion Model developed based on Gaussian plume equation was AERMOD (The American Meteorology Society-Environmental Protection Agency Regulatory Model) which is recommended for air quality simulations by the US EPA (2005). This models stand for the state-of-the-science in air quality modelling and provide powerful features to simulate various modelling situations and considerations.

AERMOD View incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

The AERMOD modelling system is composed of three components:

- AERMET – the meteorological data pre-processor;
- AERMAP – the terrain data pre-processor;
- AERMOD – the air dispersion model.

AERMET and AERMAP provide input for the AERMOD calculations. AERMET is a meteorological data pre-processor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts; AERMAP is a terrain data pre-processor that incorporates complex terrain using USGS Digital Elevation Data; and AERMOD incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain (EPA 2020).

AERMOD is a short-term model. AERMOD runs on an hourly basis with hourly emission rates and hourly meteorological conditions; the hourly averages are aggregated to arrive at annual averages.

Assumptions for the modelling

1. Flat terrain was assumed
2. The meteorological data of Palwal and Sonipat monitoring field stations were used. Upper air data was generated by the AERMET.
3. The emissions were estimated from two sets of wind rose.
4. Emissions from generator(s) were modelled as individual point sources.
5. Stack parameters for the point sources were based on design parameters.
6. For the worst-case scenario, it was assumed that the construction work will start at all stations locations simultaneously and the work will be done 24x7.
7. Earth work along the proposed track will be done with 150m³/m volume and an emission for the same is considered as line source.
8. The emissions from the generator sets are continuous.
9. At all Station locations similar kind of civil works will be carried out hence power utilized is the same.
10. The meteorological studies were conducted between December 2020 to February 2021(winter season), hence the worst climate in which the atmospheric dispersion is minimum and ground pollution is maximum was also accounted for.
11. Carbon Monoxide emissions were calculated for 8-hour Maximum and three months average.

12. Particulate Matter (<2.5 μm and < 10 μm), Sulphur Dioxide and Nitrogen Dioxide emissions were calculated for 24-Hour Maximum and three months average
13. There is no deposition, washout, chemical conversion, or absorption of pollutants by the ground or other physical bodies, and no chemical conversion of the pollutants (i.e., secondary formation of $\text{PM}_{2.5}$ or formation of ozone).
14. The Maximum ground level concentration at the monitoring locations is adopted as baseline value for the proposed stations as the local micro meteorological data remains the same within 5km distance.

Wind data was measured at five locations between December 2020 to February 2021. It was found that the wind directions differed in Palwal and Sonipat region, hence as per the wind sectors the AERMOD View was run separately for the two regions (i) From New Parithala to Badli Railway Station and (2) from Badli to Harsana Railway station. Hourly surface wind data was obtained from the weather stations at the locations of wind Rose and the upper air data was generated by AERMOD at these locations for the monitoring months. The input data is emissions from the generator sets used at these locations during the construction phase.

Table 5.3: Input Data for Construction Sites at Proposed Stations

S. No.	Particulars	DG Capacity in KVA	Height of the stack	Dia m	Exit temp $^{\circ}\text{K}$	Ambient Temp $^{\circ}\text{K}$	Vel m/s	$\text{PM}_{2.5}$ g/s	PM_{10} g/s	SO_2 g/s	NO_2 g/s	CO g/s
1	New Prithala	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
2	Silani	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
3	IMT Sohna	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
4	Dhulawat	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
5	Chandla Dungerwas	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
6	Manesar	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
7	New Patli	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
8	Badsa	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
9	Devarkhana	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
10	Badli	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
11	Mandothi	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
12	Jasurkheri	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
13	Kharkhoda	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
14	Tarakpur	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02
15	Harsankalan	25	11	0.05	450	313	3.5	0.02	0.03	0.01	0.03	0.02

The Incremental value for $\text{PM}_{2.5}$, PM_{10} , SO_2 , NO_2 and CO at the station locations is shown below in **Figure 5.1** to **Figure 5.5** below. The maximum GLC is taken into account and added to the maximum measured ambient value. Station wise incremental value is given in **Annexure 5.2**.

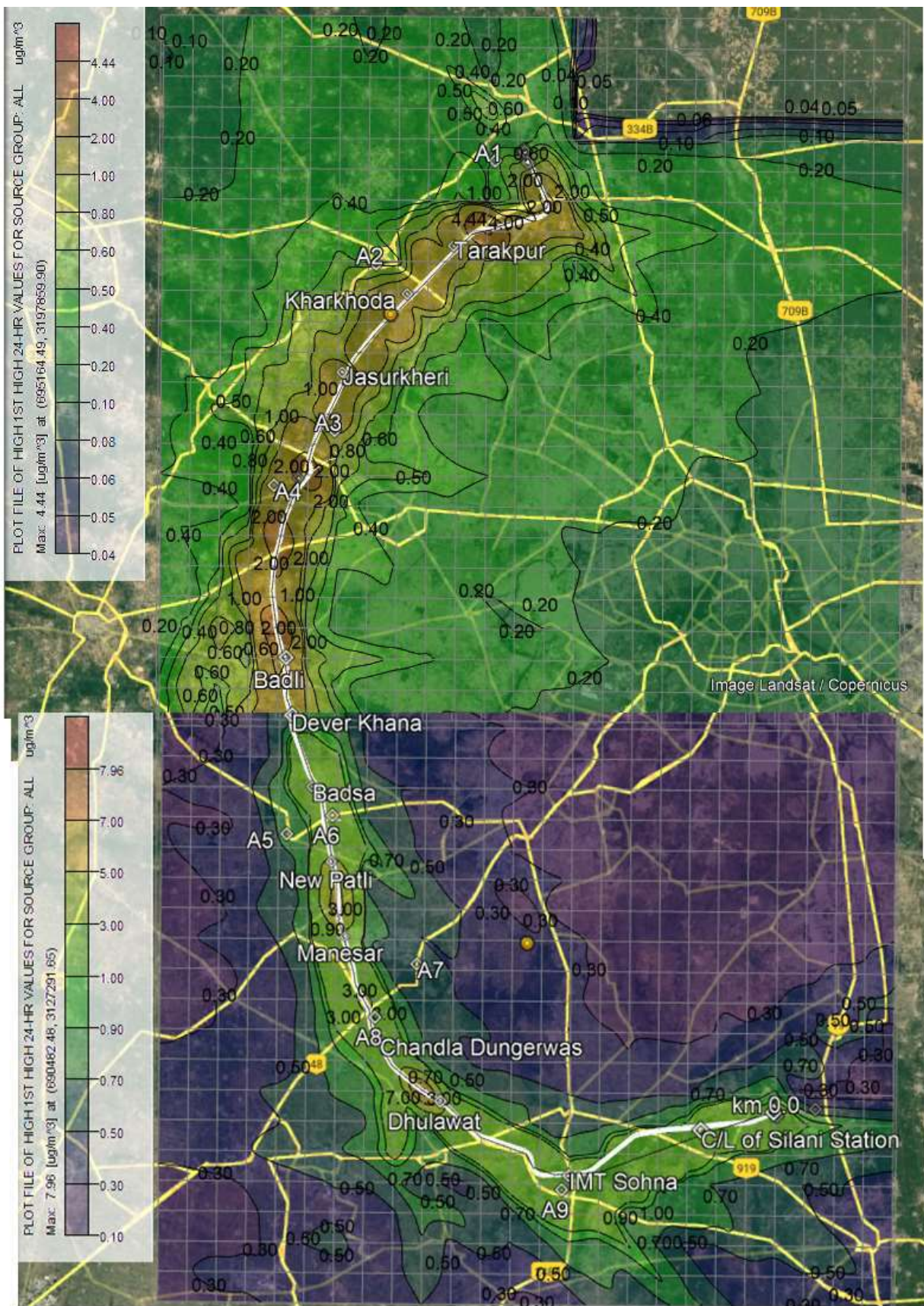


Figure 5.1: Incremental Value for PM_{2.5}

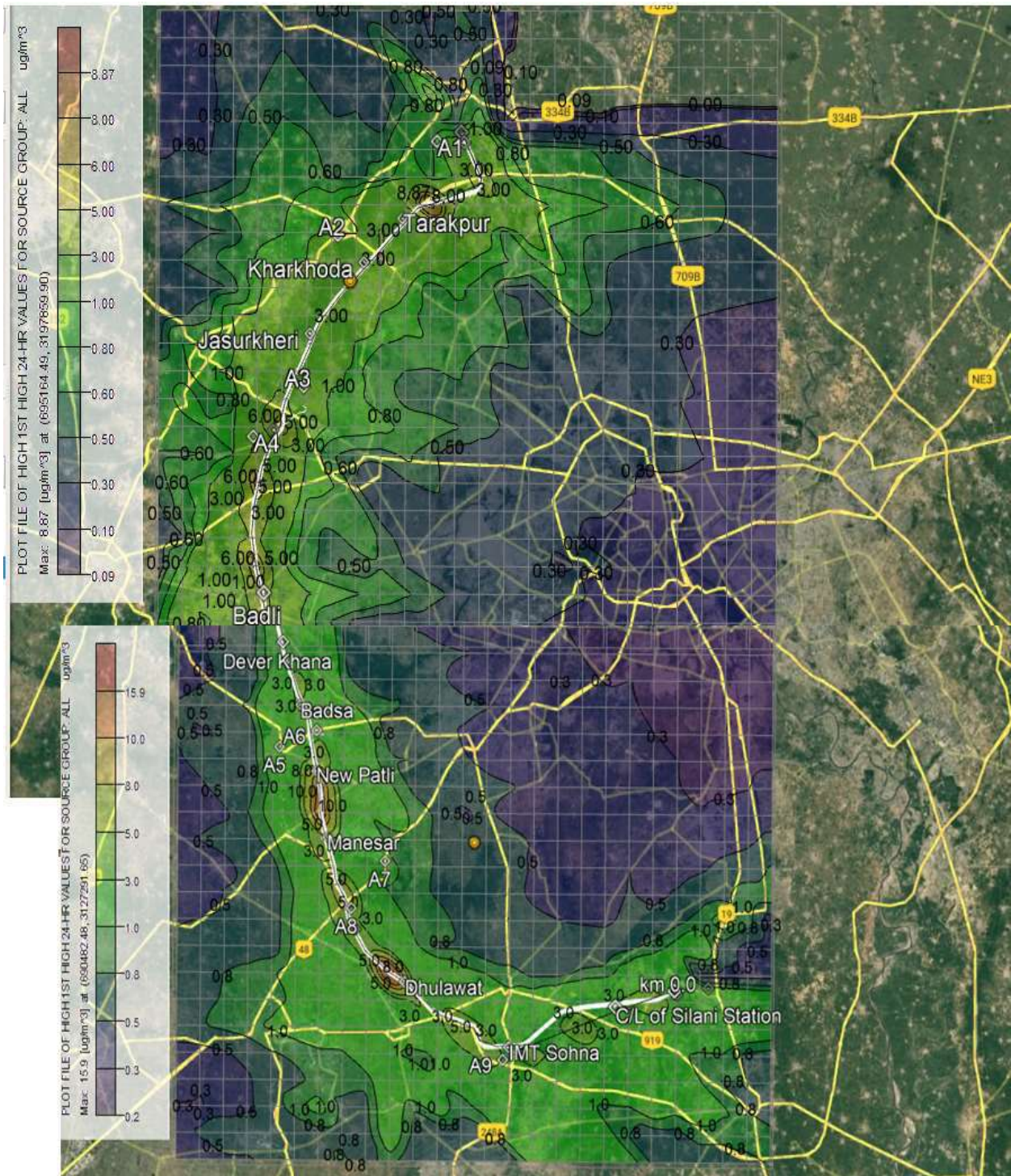


Figure 5.2: Incremental Value for PM₁₀

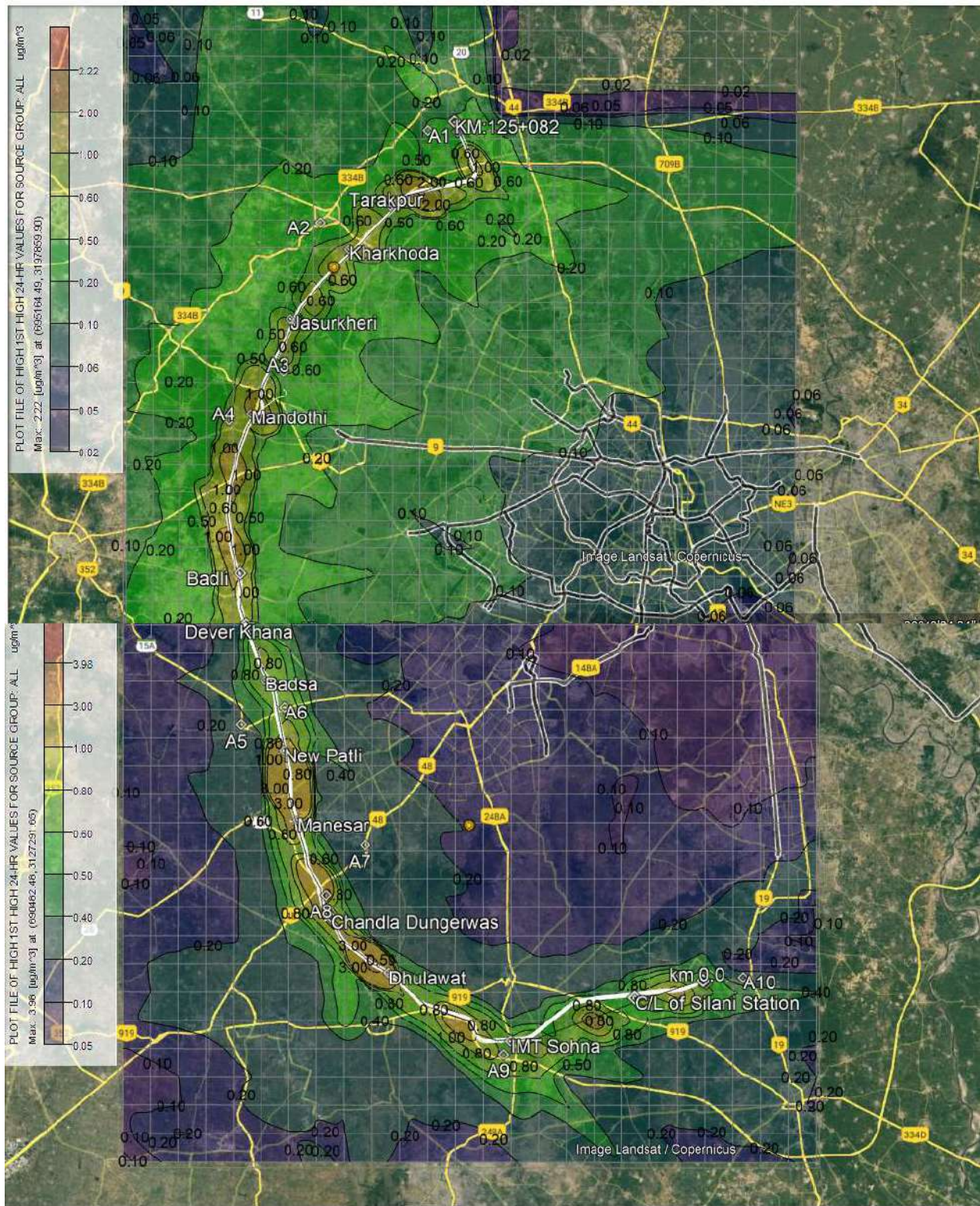


Figure 5.3: Incremental Value for SO₂

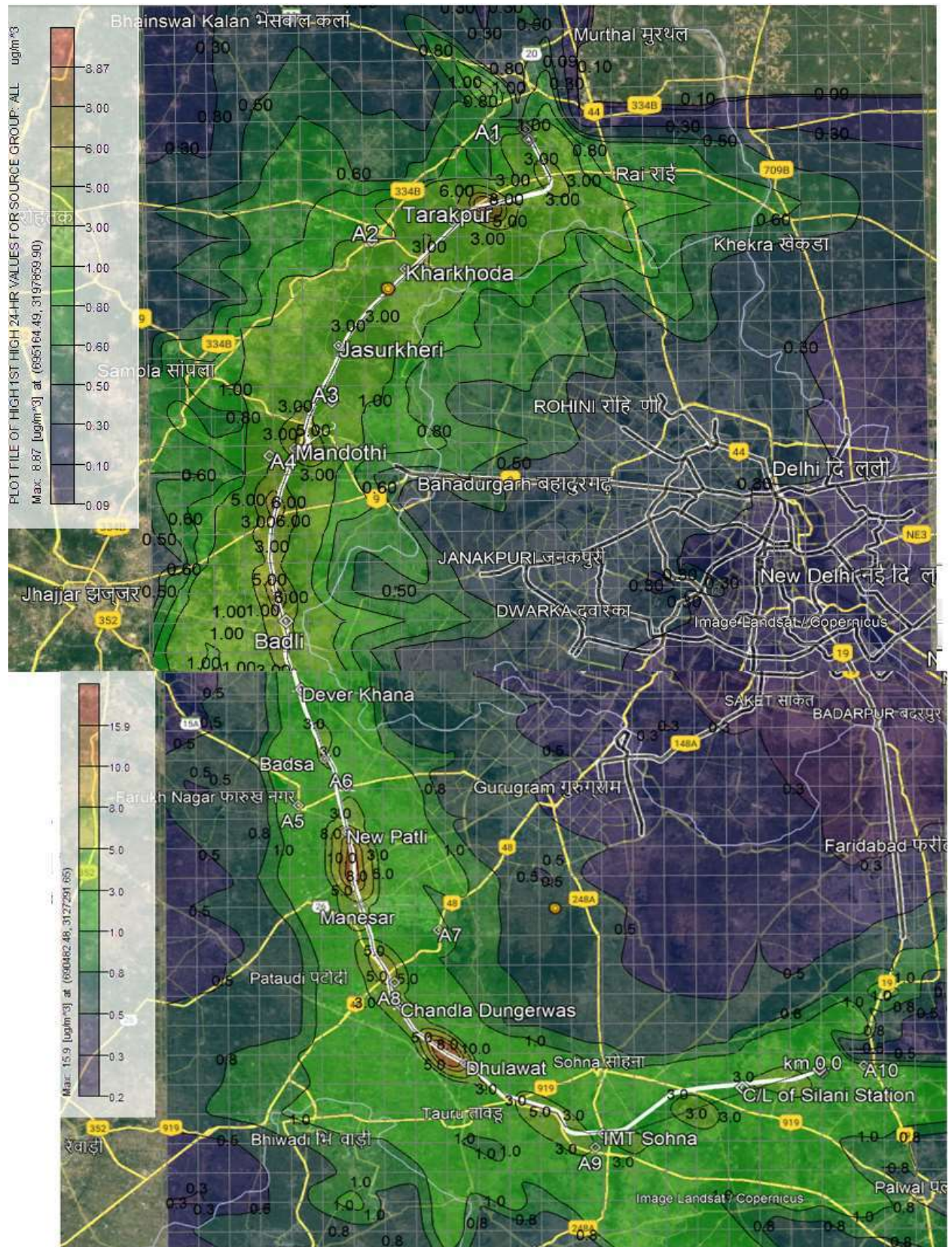


Figure 5.4: NO₂ Incremental GLC for all station

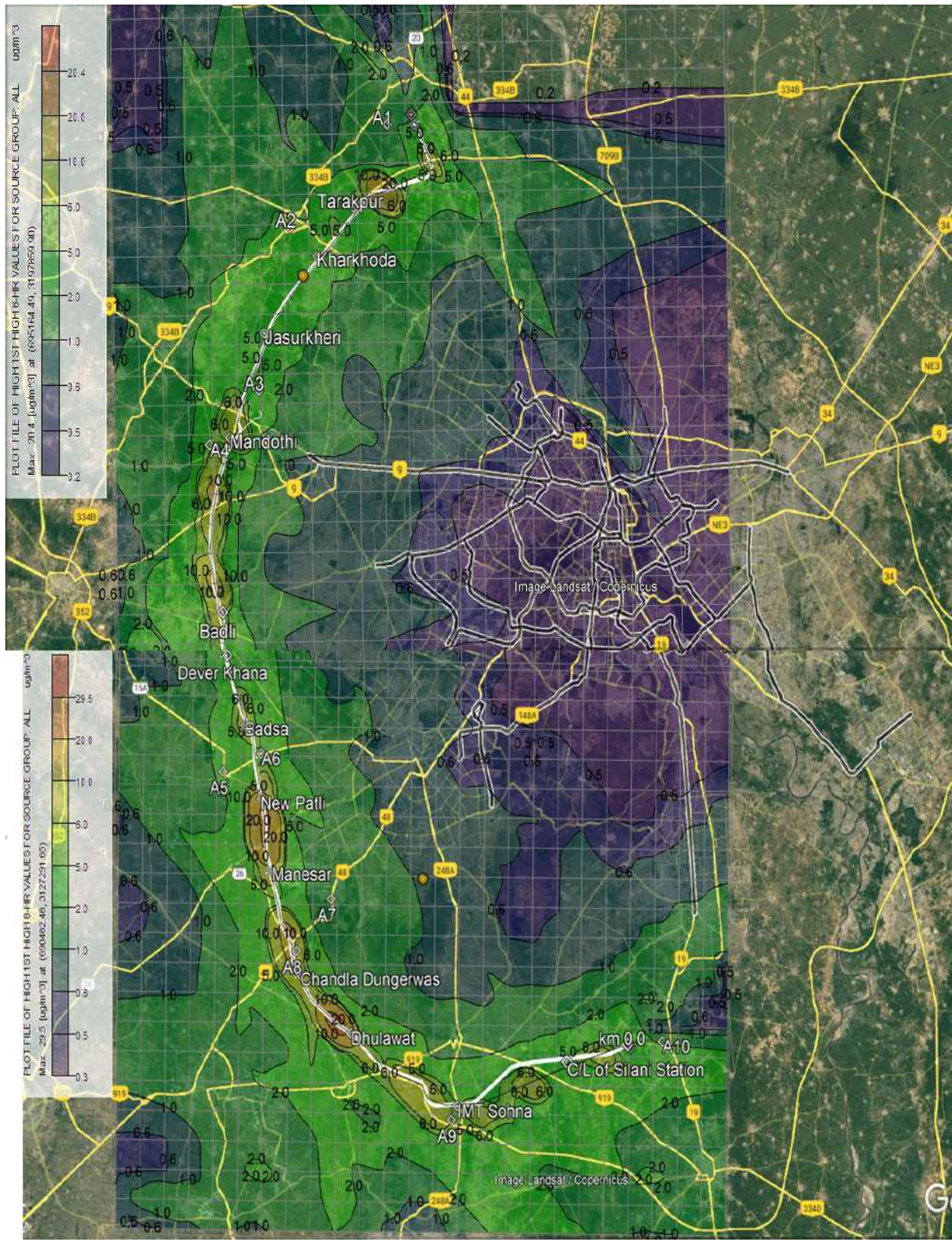


Figure 5.5: Incremental Value for CO

Table 5.4: Incremental Values at Proposed Station Locations During Construction Phase

S. No	Name of Proposed Station	Proposed Chainage (in km)	Latitude	Longitude	Increase ($\mu\text{g}/\text{m}^3$)				
					PM _{2.5}	PM ₁₀	SO ₂	NO _x	CO
1	New Prithala	0	28°14'33.66"N	77°15'7.43"E	3.0	3.0	1.0	3.0	6.0
2	Silani	6.5	28°13'40.20"N	77° 9'12.46"E	3.0	3.0	0.6	3.0	6.0
3	IMT Sohna	11.977	28°10'57.50"N	77° 4'56.69"E	3.0	3.0	0.8	3.0	6.0
4	Dhulawat	28.846	28°15'1.32"N	76°57'24.52"E	7.96	15.9	3.98	15.9	29.5
5	Chandla Dungerwas	39.45	28°17'41.66"N	76°54'13.66"E	3.0	5.0	1.0	5.0	10
6	Manesar	48.593	28°22'23.49"N	76°52'27.12"E	5.0	10.0	3.0	10	20
7	New Patli	54.7	28°25'45.93"N	76°51'52.54"E	5.0	5.0	1.0	5.0	10
8	Badsa	61.957	28°29'11.25"N	76°51'0.83"E	3.0	1.0	0.8	3	6.0
9	Devarkhana	67.806	28°32'18.61"N	76°49'40.42"E	1.0	1.0	0.4	1.0	2.0
10	Badli	77.027	28°35'26.01"N	76°49'10.49"E	2.0	6.0	1.0	6.0	10
11	Mandothi	83.808	28°42'36.00"N	76°50'26.45"E	2.0	6.0	1.0	6.0	6.0
12	Jasurkheri	97.103	28°47'14.65"N	76°52'38.94"E	1.0	3.0	0.6	3.0	5.0
13	Kharkhoda	105.885	28°50'44.47"N	76°56'3.86"E	1.0	3.0	0.6	3.0	5.0
14	Tarakpur	110.948	28°52'50.81"N	76°58'30.92"E	1.0	8.87	2.22	8.87	20.4
15	Harsana Kalan	121.742	28°56'41.57"N	77° 2'18.72"E	2.0	3.0	1.0	3.0	6.0

Inference: The incremental values are slightly higher with respect to other proposed station locations at Dhulawat, Manesar, New Patli and Tarakpur due to the low wind speeds at these location.

Table 5.5: Predicted Values at Monitoring Locations During Construction Phase

S. No.	Station Code	Limit	Parameter and Results				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO
			$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
Limits as Per CPCB Guidelines			100 (24 hrs)	60 (24 hrs)	80 (24 hrs)	80 (24 hrs)	4000 (4 hr)
1	AAQM 1	Harsana kalan					
		Maximum	78.48	58.64	18.4	7.64	2200
		Increment	0.8	0.4	0.8	0.2	1.0
			79.28	59.04	19.2	7.84	2201
2	AAQM 2	Kharkhoda Town					
		Maximum	82.94	62.34	12.34	8.66	2800
		Increment	1.0	0.5	1.0	0.2	2.0

S. No.	Station Code	Limit	Parameter and Results				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO
			µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
		Total	83.94	62.84	13.34	8.86	2802
3	AAQM 3	Asoda Town					
		Maximum	88.48	56.82	15.82	7.26	2800
		Increment	1.0	1.0	1.0	0.5	2.0
		Total	89.48	57.82	16.82	7.76	2802
4	AAQM 4	Mandothi					
		Maximum	74.56	48.12	14.58	7.46	2200
		Increment	1.0	1.0	1.0	0.6	5.0
		Total	75.56	49.12	15.58	8.06	2205
25	AAQM 5	Near Sultanpur village					
		Maximum	88.72	55.64	12.34	6.42	2900
		Incremental	1.0	0.9	1.0	0.2	2.0
		Total	89.72	56.54	13.34	6.62	2902
6	AAQM 6	Farukh Nagar Town					
		Maximum	199.84	98.26	46.34	28.54	3600
		Incremental	1.0	3.0	1.0	0.6	2.0
		Total	200.84	101.26	47.34	29.14	3602
7	AAQM 7	Manesar Town					
		Maximum	98.34	58.62	15.26	8.16	2800
		Increment	1.0	0.7	1.0	1.0	1.0
		Total	99.34	59.32	16.26	9.16	2801
8	AAQM 8	Fazalwas Village					
		Maximum	78.62	52.34	13.24	6.82	2400
		Increment	3.0	3.0	5.0	1.0	10.0
		Total	81.62	55.34	18.24	7.82	2410
9	AAQM 9	Khedli Kankar Village near Sohna					
		Maximum	88.36	27.88	18.62	8.62	2200
		Increment	3.0	3.0	3.0	0.6	6.0
		Total	91.36	30.88	21.62	9.22	2206
10	AAQM 10	New Parithala Rly station					
		Maximum	84.34	55.97	37.94	7.84	2800
		Increment	1.0	3.0	1.0	0.2	1.0
		Total	85.34	58.97	38.94	8.04	2801

5.3.6 Quarries and borrow areas

The excavation of quarries and borrow pits used for obtaining soil and aggregate materials for construction can cause direct, and indirect long-term major adverse impacts on the environment. While loss of productive soil is the most direct negative impact, other significant indirect negative impacts can also occur.

Since most of the construction materials would be available from existing quarries nearby, relatively few new borrow areas will be required. One of the long-term residual adverse impacts of borrow pits not reclaimed is the spread of malaria. Mosquitoes breeding and multiplying in stagnant water that collects in these pits can affect humans in villages and towns close to the features.

5.3.7 Contamination of Soil

In this project contamination of the soil may take place, from construction zones, labour camps, batching plant and construction yards sites and other auxiliary facilities required for the construction. Details of the activities from which the contamination can occur are presented below:

- Debris generation due to dismantling of structures;
- Maintenance of the machinery and operation of the diesel generator sets on site;
- Oil Spill from the operation of the diesel pumps and diesel storage, during transportation and transfer; parking places, and diesel generator sets;
- Operation of the residential facilities for the labour;
- Storage and stock yards.

5.3.8 Impact on Water Quality

Increased Sedimentation

Loose soil due to construction activities like removal of trees, removal of grass cover, excavation, stock piling of materials as part of the pre-construction and construction activities gives rise to degradation of water quality due to sediment transport to the surface waterbody. There is no river crossing or major water body nearby the project alignment. Canals and drains are crossing the alignment, details of which are given in **Chapter-4**. The impacts due to increased sediment laden run-off will make the water more turbid and is a significant negative impact on the water bodies. The canals are irrigation canals supporting no aquatic life. Therefore impact on aquatic life is not envisaged. Heavier sediment may affect the algae growing in the lower strata and could reduce the water carrying capacity.

Contamination of Water

The degradation of the surface water quality may occur due to construction works, bridge construction works, construction plants, machinery and accommodations of workers but there are less chances for the ground water to be impacted. The sources of water pollution from the construction activities are as follows;

- From the foundation works of the bridges and culverts such as piling and excavation for open foundations;
- Oil spills from the Maintenance of the machinery and operation of the diesel generator sets on site;
- Oil Spill from the operation of the diesel pumps and diesel storage, transportation and transfer, parking places, and diesel generators;
- Operation of the residential facilities for the labor & offices for construction staff;
- Storage and stock yards

The possibility of accidental discharges into watercourses from drainage of workers camps and from spillages from vehicle parking and/or fuel and lubricant storage areas may also occur during construction of the works affecting the water courses.

5.3.9 Storage, Handling and Disposal of solid, Hazardous and C&D waste

Improper disposal of municipal solid waste generated from labour camps can pollute canal water and groundwater. Solid waste generated from the daily activities will be handled as per the Solid Waste Management and Handling Rules, 2016.

During Construction C&D waste will also be generated. Uncontrolled C&D waste disposal can result in air and water pollution, diversion of agricultural fields and temporary displacement. The contractor shall handle the C&D waste as per Construction and Demolition Waste Management Rules, 2016.

During Construction, Hazardous waste would mainly arise from the maintenance of equipment which may include used engine oils, hydraulic fluids, waste fuel, spent mineral oil/cleaning fluids from mechanical machinery, scrap batteries or spent acid/alkali, spent solvents, oil filters etc. Unsafe disposal can result in water and soil pollution, diversion of agricultural fields and temporary displacement. The contractor will be responsible for safe and environmentally sound management of hazardous and other wastes. Hazardous waste will be handled as per Hazardous and Other Waste Management and Handling Rules, 2016 and its amendments. Contractor shall arrange the facilities for collection & disposal of hazardous waste. Waste should be disposed by the authorized vendor.

5.3.10 Risk Due to Natural Hazards

The project area lies in Zone IV as per revised Seismic Zoning Map of India corresponding to moderate seismic hazard. No other natural hazards due to climate change are foreseen. Provision of Bureau of Indian Standards codes shall be incorporated suitably while designing the structures.

5.3.11 Impact Due to Climate Change

Generic impacts of climate change on rail infrastructures/assets as identified in numerous literatures are briefly outlined here. These impacts call for careful consideration of rail design, construction, and maintenance to achieve lasting benefits.

- Rise in air temperature and temperature extremes can accelerate buckling of rail tracks. Under direct sunlight, tracks can get as high as 20°C hotter than the ambient air hence this causes metal to expand, putting it at risk of misalignment and deformations that are introduced in rail when the weight of train cars put stress in areas that are weakened by exposure to excessive heat
- Rise in air temperature and temperature extremes can cause overhead electrical lines to expand and sag in heat with the danger of touching the tops of train carriages
- Rise in temperature extremes impacts on concrete construction practices, including thermal expansion affecting rail bridge expansion joints
- Changes in rainfall, temperature, and evaporation patterns can alter the moisture balances in rail track bed foundations and formations
- Rise in the water table can lead to the reduction of the structural strength of the formations, leading to damages to earthworks, embankments, and drainage systems
- Precipitation increase and increase in intense precipitation events can cause overloading of drainage systems, causing backups, flooding, and track formation washouts

- Changes in seasonal precipitation and river flow patterns induce increased risk of floods from runoff, landslides, slope failures, and damage to rail track formation and bridges
- Storms can bring about increased flooding, greater probability of infrastructure failures, erosion of rail track foundation and bridge supports, bridge scour, reduced clearance under bridges, wind damage to roofs of stations, lighting, overhead cables, rail signals, and other tall structures, uprooting of trees etc.

The climate risk screening for the project is carried out with the help of Aware™ geographic data set, compiled from the latest scientific information on current geological, climate and related hazards together with projected changes for the future where available. These data are combined with the project's sensitivities to hazard variables, returning information on the current and potential future risks that could influence its design and planning. Resultant Climate Risk Classification for the project is Medium Risk.

Long term climate change risks that could impact project are flooding from extreme rainfall events, particularly during monsoon periods, and increases in annual average temperature in the project area that could increase the risk of extreme hot days. Heat waves and flooding appear as priority threats. Adaptation may involve additional investments on design and materials, use/installation of new technologies, and improved operation and maintenance. The detailed Climate Risk assessment Report for the project is given at **Annexure 5.1**.

5.3.12 Operation of Construction Equipments and Movement of Vehicles

Noise is a contributing factor in degradation of human health. The major sources of noise pollution during construction phase are operation of construction equipments and movement of vehicles for transportation of material and equipments. Typical noise from construction equipments (L_{max}) at 50 feet distance ranged from 76 dB (A) to 98 dB (A) (**Table 5.6**), which decreases with increase in distance.

In addition to the noise mentioned above, there will also be background noise of the usual traffic resulting due to traffic congestion. Efforts should be made to keep the noise levels under control by appropriate noise attenuation and adopting employee safety measures. Temporary route direction markings will be placed in appropriate locations. During construction phase, the increase in vehicular movement is expected to increase up to a maximum of 5 to 6 trucks/hour. Typical increase in ambient noise level due to increased vehicular movement will be double of background noise level at 10m distance.

Noise prediction is carried out for different typical combinations of noise producing construction equipments working simultaneously at a site versus the distance. The result of the noise prediction during construction phase is presented in **Table 5.7**

Table 5.6: Average Noise Levels Generated by Operation of Various Construction Equipment

Equipment	Typical Noise Level (dBA) at 50 ft from source
Air Compressor	81
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane Derrick	88
Crane Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile Driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rock Drill	98
Roller	74
Scraper	89
Shovel	82
Truck	88

Source: FTA Transit Noise and Vibration Guidance Handbook, May 2006

Table 5.7: Noise Level Prediction During Construction dB (A)

Distance (m)	Concrete Batch Plant + Concrete Mixer Truck		Auger Drill Rig + Dump Truck + Generator + Slurry Plant		Dump Truck + Excavator + Pneumatic Tools	
	Lmax	Leq	Lmax	Leq	Lmax	Leq
5	92.7	87.5	94	92.5	94.9	93.3
10	86.7	81.5	88	86.5	88.8	87.3
15	83.1	77.9	84.5	83	85.3	83.7
20	80.6	75.4	82	80.5	82.8	81.2
25	78.7	73.5	80.1	78.6	80.9	79.3
30	77.1	71.9	78.5	77	79.3	77.7
35	75.8	70.6	77.1	75.6	78.0	76.4
40	74.6	69.4	76	74.5	76.8	75.2
45	73.6	68.4	75	73.4	75.8	74.2
50	72.7	67.5	74	72.5	74.9	73.3
55	71.9	66.7	73.2	71.7	74.0	72.5
60	71.1	65.9	72.5	71	73.3	71.7
65	70.4	65.2	71.8	70.3	72.6	71.0
70	69.8	64.6	71.1	69.6	71.9	70.4
75	69.2	64	70.5	69	71.3	69.8
80	68.6	63.4	70	68.5	70.8	69.2
85	68.1	62.9	69.4	67.9	70.3	68.7
90	67.6	62.4	68.9	67.4	69.8	68.2
95	67.1	61.9	68.5	67	69.3	67.7
100	66.7	61.5	68	66.5	68.8	67.3

Impacts of Noise on Labour

The effect of high noise levels on the operating personnel must be considered as this may be particularly harmful. It is known that continuous exposures to high noise levels above 90 dB(A) affects the hearing acuity of the workers/operators and hence, should be avoided. To prevent these effects, it has been recommended by Occupational Safety and Health Administration (OSHA) that the exposure period of affected persons is limited as in Table below:

Maximum equivalent continuous Noise level dB(A)	Unprotected exposure period per day for 8 hrs/day and 5 days/week
90	8
95	4
100	2
105	1
110	½
115	¼
120	No exposure permitted at or above this level

5.3.13 Vibration Impacts and Risk to Existing Buildings

Human response to vibration is subjective. When the vibrations reach the floors and walls it may result in perceptible vibration depending on the amplitude and frequency of the vibrations. Rattling of windows, dishes, and similar parts may also result in audible noise which is called ground-borne noise. Ground-borne vibration can be a major concern for nearby neighbours of a transit system route or maintenance facility. Some common sources of ground-borne vibration are trains, buses on rough roads, and construction activities such as blasting, pile-driving and operating heavy earth-moving equipment. Typical background vibration level is usually about 50 VdB, human perception threshold is 65 VdB, and residential annoyance level is 70 VdB to 80 VdB. The vibration impact criterion is 72 VdB for residences for residential land-use. Threshold criteria for various type of structures are listed in **Table 5.8**. Typical vibration levels due to working of construction equipment for a wide range of soil conditions are summarized in **Table 5.9**.

Table 5.8: Guideline Vibration Damage Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous / frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment. *Source: Transportation and Construction Vibration Guidance Manual, Caltrans, September 2013.*

Table 5.9: Vibration Source Levels of Construction Equipment

Equipment		PPV at 25 ft (inch/sec)	Approx Lv* at 25 ft (VdB)
Pile Driver (Impact)	Upper Range	1.518	112
	typical	0.644	104
Pile Driver (sonic)	Upper Range	0.734	105
	typical	0.17	93
Clam shovel drop (slurry wall)		0.202	94
Hydromel (slurry wall)	in soil	0.008	66
	in rock	0.017	73
Large Bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded Trucks		0.076	86
Jackhammer		0.035	79
Small Bulldozer		0.003	58

*RMS velocity in decibels (VdB) re 1 μ inch/second

Source: Transit noise and vibration impact assessment, Federal Transit Administration 2006.

Peak particle velocity (PPV) in in/sec for various equipment adjusted for the distance (D) has been estimated conservatively (no mitigation measures along the wave propagation) at different distances and presented in **Table 5.10**. Considering impact pile driver, which is a conservative scenario, estimated vibration levels at structures which are located at distance less than 20 m from source are at risk of damage. It is seen that no residential/sensitive receptor is within 20m from alignment. The construction equipments will be operating within RoW. Hence vibration impact due to construction equipments is not anticipated during construction phase. **Table 5.11** shows that which type of structure can be impacted at which distance by particular equipment. As seen from **Table 5.11**, the maximum impact can be only upto 20m in case of Impact pile driver on older residential structure, if any.

Table 5.10: Estimated Vibration Levels for Different Construction Equipments (PPV in/sec)

Equipment		Distance (m)									
		5	10	15	20	25	30	35	40	45	50
Pile Driver (Impact)	Upper Range	2.86	1.01	0.55	0.36	0.25	0.19	0.15	0.13	0.11	0.09
	Typical	1.21	0.43	0.23	0.15	0.11	0.08	0.07	0.05	0.04	0.04
Pile Driver (sonic)	Upper Range	1.38	0.49	0.27	0.17	0.12	0.09	0.07	0.06	0.05	0.04
	Typical	0.32	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01
Clam shovel drop (slurry wall)		0.38	0.13	0.07	0.05	0.03	0.03	0.02	0.02	0.01	0.01
Hydro mill (slurry wall)	in soil	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	in rock	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Large Bulldozer		0.17	0.06	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Caisson drilling		0.17	0.06	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Loaded Trucks		0.14	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.00

Equipment		Distance (m)									
		5	10	15	20	25	30	35	40	45	50
Jackhammer		0.066	0.023	0.013	0.008	0.006	0.004	0.004	0.003	0.002	0.002
Small Bulldozer		0.006	0.002	0.001	0.001	0.001	0.000	0.0003	0.0002	0.0002	0.0002

Table 5.11: Vibration Impact Table

Equipment		Distance (m)			
		5	10	15	20
Pile Driver (Impact)	Upper Range	ORS/NRS/MI/CB	ORS/NRS/MI/CB	ORS/NRS/MI/CB	ORS
	Typical	ORS/NRS/MI/CB	ORS		
Pile Driver (sonic)	Upper Range	ORS/NRS/MI/CB	ORS		
	Typical	ORS			
Clam shovel drop (slurry wall)		ORS			

ORS: Older residential structures, NRS: New residential structures, MI/CB: Modern industrial/commercial buildings.

5.3.14 Traffic Diversions

During construction period, complete/partial traffic diversions on road will be required where the construction activities are on the road.

5.3.15 Occupational Health and Safety of Labour

During construction, workplace should be free from hazards which cause or are likely to cause injury or occupational disease to the employees. Construction industry, often termed as ‘high-risk’, has a significant impact on the health and safety of the workers. Though it is common to see a construction worker working at heights with equipment and building materials, these scenarios are plagued by potentially dangerous situations and poor working conditions. During construction, there may be number of hazards, including:

- Risk of electrocution – With high voltage electricity and dedicated electric generators nearby on some portions of the track, there is a very high risk of electrocution.
- Plant vehicles – From forklifts to large, earthmoving equipment, the risk of being hit by a vehicle on a construction site is very real.
- Fatigue – Whether it’s the night shift, long hours or just a lack of sleep, fatigue on a construction site often results in accidents.
- Human error – We’re all human and mistakes can happen, but when they cost lives and are preventable, it’s time to look at equipment and best practices.
- Moving trains – Arguably the biggest risk is being hit by a train while working on the track, something which should never happen with the right equipment in place.

5.3.16 Impact due to Tunnel Construction

Construction of Tunnel of 2.88 km will be carried out from Chainage 24200m to 27080m by New Austrian Tunneling Method (NATM). In this method the excavation location of tunnel is divided into segments first. The segments are then mined sequentially with supports. Some mining equipments such as road headers

and backhoes are commonly used for the tunnel excavation. The ground for excavation must be fully dry for applying the NATM and ground dewatering is also an essential process before the excavation. Another process relates to the ground modifications such as grouting, and ground freezing is also common with this method in order to stabilize the soil for tunneling. This method is relatively slow but is found useful in areas where existing structures such as sewer or subway could not be relocated. Environmental benefits and demerits of NATM is as under:

- Potential environmental impacts in terms of noise, dust and visual on sensitive receives are significantly reduced and are restricted to those located near the tunnel portal, launching and retrieval shafts;
- Compared with the cut-and-cover approach, quantity of C&D materials generated would be much reduced;
- Compared with the cut-and-cover approach, disturbance to local traffic and associated environmental impacts would be much reduced;
- Blasting would significantly reduce the duration of vibration, though the vibration level would be higher compared with bored tunneling;
- Similar to the drill-and-blast and bored tunneling methods, only localized potential environmental impacts would be generated;
- As the method is relatively slow, duration of potential environmental impacts would be longer than that of the other methods.

5.3.17 Noise and Vibrations Impact due to Tunnel Construction

Noise: It is expected that noise level due to blasting operations are expected to be of the order of 75-86 dB (A). As the blasting is likely to last for 4 to 5 seconds depending on the charge, noise levels over this time would be instantaneous and short in duration. Considering attenuation due to various sources, even the instantaneous increase in noise level is not expected to be more than 60 dB (A). Hence, noise level due to blasting is not expected to cause any significant adverse impact.

Vibration: The explosive energy generated during blasting sets up a seismic wave within the surface, which may affect the structures and cause discomfort to human population. When an explosive charge is fired in a hole, stress waves traverse in various directions, causing the rock particles to oscillate. Blasting also generates ground vibrations and instantaneous noise. Noise in and around the construction site will likely affect the wildlife and residents in the nearby areas. Wildlife in the area will likely to move away from the noise and eventually return to the area when construction is complete.

5.3.18 Impact due to Generation and Disposal of spoil

The waste generated from tunnel construction will be excavated material like rock and soil. The estimated quantity of waste generated will be 2.44 lakh cum (rock is 1.2 lakh cum and soil 1.24 lakh cum). Excavated materials from tunnelling work will be disposed off by utilizing the same in Approaches of tunnel i.e. Rock material in viaduct on Palwal side as well as in tunnel concreting and soil material in embankment on Sonipat end.

5.4 ENVIRONMENTAL IMPACTS DUE TO PROJECT OPERATION

Operation of the project may cause positive as well negative impact on the environment. Activities from which the impact will be introduced are as follows:

- Right of Way, Alignment and Architecture
- Operation of Train.
- Operation of Stations

5.4.1 Right of Way, Alignment and Architecture

As much of the alignment and stations are at-grade, visual intrusion will be less experienced. Noise during operation will be higher. Stations will result in accumulation of passengers and likely congestion especially due movement of vehicles carrying goods for freight.

5.4.2 Operation of Train

During operation running of train produces noise and vibration. The sources of the noise and vibration induced by the trains are mainly the rolling stock, track and the interaction between them. Impacts from running of train are as follows:

5.4.2.1 Noise from Operation of Train

Rail noise depends on the types of trains, track-type, driving speed and driving mode. For every kind of wheel, the most important acoustic emission mechanisms are rolling noise, squeal noise and impact noise (due to wheel or local rail defects). Its level depends on the track and wheel type and condition of the brake system and the type of wagon coupling mode, and the axial load. Rail traffic noise is also generated by the drive mechanism for moving parts and auxiliary equipment (air compressors, radiators, cooling fans, heating and air conditioning equipment). Railways are one of the main sources of noise, with a particularly strong negative impact on the environment and on the health of children and adults. Environmental noise externalities, rail noise and vibration can cause minor and major adverse events. Mainly the noise caused by trains and traffic is associated with general feelings of displeasure, discomfort, and annoyance.

Noise modelling is carried for prediction of noise at various sensitive receptors from track. For noise prediction landuse category is taken as Residential; the speed of the train is taken as 65km/hr and track is at grade. Existing noise level is taken as 54.0 dB (A) during day and 44.3 dB(A) during night which is average of baseline noise monitoring results. Train operation plan is taken as per **Table 5.12**. The predicted noise levels at sensitive receptors are given in **Table 5.13**. It is seen that, increase in Noise levels due to operation of train will be very less w.r.t baseline noise levels.

Table 5.12: Train operation Plan for Noise Prediction

Year	2027	2052
Train/hr (day)	4	8
Train/hr (night)	3	5

Table 5.13 Noise at Sensitive structure (2027)

S.No	Village	Distance (km)	Distance (m)	Distance (FT)	Existing Noise		Project Noise		Cummulative Noise		Increased noise level	
					(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night
A) Habitation												
1	Asoti	0.19	190	623.20	54.09	44.03	43.5	41.8	54.45	46.07	0.36	2.04
2	Jataula	0.13	130	426.40	54.09	44.03	45.5	44.3	54.65	47.18	0.56	3.15
3	Pirthala	0.42	420	1377.60	54.09	44.03	37.9	36.6	54.19	44.75	0.10	0.72
4	Chhaprola	0.11	110	360.80	54.09	44.03	46.6	45.4	54.80	47.78	0.71	3.75
5	Khoontpuri	0.1	100	328.00	54.09	44.03	47.2	46	54.90	48.14	0.81	4.11
6	Silani	0.22	220	721.60	54.09	44.03	42.1	40.9	54.36	45.75	0.27	1.72
7	Karnki	0.34	340	1115.20	54.09	44.03	39.3	38	54.23	45.00	0.14	0.97
8	Sancholi	0.32	320	1049.60	54.09	44.03	39.7	38.4	54.25	45.08	0.16	1.05
9	Sheikhpur	0.12	120	393.60	54.09	44.03	46.1	44.8	54.73	47.44	0.64	3.41
10	Kalwari	0.3	300	984.00	54.09	44.03	40.1	38.8	54.26	45.17	0.17	1.14
11	Fazalwas	0.06	60	196.80	54.09	44.03	50.6	49.3	55.70	50.43	1.61	6.40
12	Eakharpur	0.23	230	754.40	54.09	44.03	41.8	40.6	54.34	45.66	0.25	1.63
13	Mokalwas	0.14	140	459.20	54.09	44.03	45	43.8	54.59	46.93	0.50	2.90
14	IMT Maneswar	0.13	130	426.40	54.09	44.03	45.5	44.3	54.65	47.18	0.56	3.15
15	Patli Hajipur	0.66	660	2164.80	54.09	44.03	34.9	33.7	54.14	44.41	0.05	0.38
16	Sultanpur	0.9	900	2952.00	54.09	44.03	32.9	31.7	54.12	44.28	0.03	0.25
17	Badli	0.81	810	2656.80	54.09	44.03	33.6	32.4	54.13	44.32	0.04	0.29
18	Bupania	0.85	850	2788.00	54.09	44.03	33.3	32	54.13	44.29	0.04	0.26
19	Daboda Khurd	0.26	260	852.80	54.09	44.03	41	39.8	54.30	45.42	0.21	1.39
20	Mandothi	0.72	720	2361.60	54.09	44.03	34.4	33.1	54.14	44.37	0.05	0.34
21	Asauda	0.83	830	2722.40	54.09	44.03	33.5	32.2	54.13	44.31	0.04	0.28
22	Jasaur Kheri	0.69	690	2263.20	54.09	44.03	34.7	33.4	54.14	44.39	0.05	0.36
23	Pehladpur Kirholi	0.59	590	1935.20	54.09	44.03	35.7	34.4	54.15	44.48	0.06	0.45
24	Malha Majra	0.21	210	688.80	54.09	44.03	42.4	41.2	54.37	45.85	0.28	1.82
25	Chhatera Bahadurpur	0.54	540	1771.20	54.09	44.03	36.3	35	54.16	44.54	0.07	0.51
26	Mandaur	0.37	370	1213.60	54.09	44.03	38.7	37.5	54.21	44.90	0.12	0.87
27	Jagdishpur	0.05	50	164.00	54.09	44.03	51.8	50.5	56.10	51.38	2.01	7.35
B) Hospitals												

S.No	Village	Distance (km)	Distance (m)	Distance (FT)	Existing Noise		Project Noise		Cummulative Noise		Increased noise level	
					(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night
1	Sri Sathya Sai Sanjeevani International Centre for Child Heart Care & Research (Baghola)	5.57	5570	18269.60	54.09	44.03	21.1	19.8	54.09	44.05	0.00	0.02
2	Govt. Hospital - Palwal	12.09	12090	39655.20	54.09	44.03	16	14.8	54.09	44.04	0.00	0.01
3	C.H.C Dudhola Govt. hospital	3.08	3080	10102.40	54.09	44.03	24.9	23.7	54.10	44.07	0.01	0.04
4	Mailk Multispecility (Delhi Alwar Road)	11.73	11730	38474.40	54.09	44.03	16.2	15	54.09	44.04	0.00	0.01
5	Civil Hospital - Baluda Rd Rajoria Nagar - Shona	6.27	6270	20565.60	54.09	44.03	20.3	19	54.09	44.04	0.00	0.01
6	Anand Hospital (Tauru)	3.33	3330	10922.40	54.09	44.03	24.4	23.2	54.09	44.07	0.00	0.04
7	Civil Hospital - Tauru	4.11	4110	13480.80	54.09	44.03	23	21.8	54.09	44.06	0.00	0.03
8	ESIC Hospital (IMT Manesar Sector 3)	3.63	3630	11906.40	54.09	44.03	23.8	22.6	54.09	44.06	0.00	0.03
9	Park Hospital (Q Block South City 2, Sohna Rd)	17.87	17870	58613.60	54.09	44.03	13.5	12.2	54.09	44.03	0.00	0.00
10	Artemis Hospital Gurgaon (Sector 51)	20.43	20430	67010.40	54.09	44.03	12.6	11.3	54.09	44.03	0.00	0.00
11	Government Hospital - Sohna, Gurugram	3.58	3580	11742.40	54.09	44.03	23.9	22.7	54.09	44.06	0.00	0.03
12	Max Hospital (Near Huda City Centre)	21.11	21110	69240.80	54.09	44.03	12.4	11.1	54.09	44.03	0.00	0.00
13	Aarvy Hospital (Civil Lines Opp Nehru Stadium)	16.11	16110	52840.80	54.09	44.03	14.1	12.9	54.09	44.03	0.00	0.00
14	Civil Hospital_Sector-10 Gurugram	13.5	13500	44280.00	54.09	44.03	15.3	14	54.09	44.03	0.00	0.00
15	RS Gaur Global Multispeciality Hospital, Jhajjar	16.7	16700	54776.00	54.09	44.03	13.9	12.6	54.09	44.03	0.00	0.00

S.No	Village	Distance (km)	Distance (m)	Distance (FT)	Existing Noise		Project Noise		Cummulative Noise		Increased noise level	
					(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night
16	Oscar Super Specialty Hospital and Trauma Centre- Jhajjar	16.64	16640	54579.20	54.09	44.03	13.9	12.7	54.09	44.03	0.00	0.00
17	Civil Hospital Jhajjar	17	17000	55760.00	54.09	44.03	13.8	12.5	54.09	44.03	0.00	0.00
18	Ujala Cygnus J. K. Hindu Hospital (Old Rohtak Rd near Hindu College of Engineering Industrial Area)	4.45	4450	14596.00	54.09	44.03	22.5	21.3	54.09	44.05	0.00	0.02
19	Janta Charitable H	5.3	5300	17384.00	54.09	44.03	21.4	20.1	54.09	44.05	0.00	0.02
20	Memorial Hospital (Mama Bhanja chowk Anand Nagar)	5.64	5640	18499.20	54.09	44.03	21	19.7	54.09	44.05	0.00	0.02
21	Haryana Multispecialty Hospital	5.17	5170	16957.60	54.09	44.03	21.5	20.3	54.09	44.05	0.00	0.02
22	Tulip Hospital	5.16	5160	16924.80	54.09	44.03	21.6	20.3	54.09	44.05	0.00	0.02
23	Civil Hospital (Delhi Road, Near Maharana Pratap Chowk)	4.98	4980	16334.40	54.09	44.03	21.8	20.5	54.09	44.05	0.00	0.02
C) School												
1	Mewat Model School, Nuh	3.55	3550	11644.00	54.09	44.03	24	22.7	54.09	44.06	0.00	0.03
2	GC senior secondary school	3.11	3110	10200.80	54.09	44.03	24.8	23.6	54.10	44.07	0.01	0.04

Noise at Sensitive structure (2052)

S.No	Village	Distance (km)	Distance (m)	Distance (FT)	Existing Noise		Project Noise		Cummulative Noise		Increased Noise level	
					(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night
A) Habitation												
1	Asoti	0.19	190	623.20	54.09	44.03	46.1	44	54.73	47.03	0.64	3.00
2	Jataula	0.13	130	426.40	54.09	44.03	48.5	46.5	55.15	48.45	1.06	4.42
3	Pirthala	0.42	420	1377.60	54.09	44.03	40.9	38.9	54.29	45.19	0.20	1.16

S.No	Village	Distance (km)	Distance (m)	Distance (FT)	Existing Noise		Project Noise		Cummulative Noise		Increased Noise level	
					(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night
4	Chhaprola	0.11	110	360.80	54.09	44.03	49.6	47.6	55.41	49.18	1.32	5.15
5	Khoontpuri	0.1	100	328.00	54.09	44.03	50.3	48.2	55.61	49.61	1.52	5.58
6	Silani	0.22	220	721.60	54.09	44.03	45.1	43.1	54.61	46.60	0.52	2.57
7	Karnki	0.34	340	1115.20	54.09	44.03	42.3	40.2	54.37	45.53	0.28	1.50
8	Sancholi	0.32	320	1049.60	54.09	44.03	42.7	40.6	54.39	45.66	0.30	1.63
9	Sheikhpur	0.12	120	393.60	54.09	44.03	49.1	47	55.29	48.77	1.20	4.74
10	Kalwari	0.3	300	984.00	54.09	44.03	43.1	41.1	54.42	45.82	0.33	1.79
11	Fazalwas	0.06	60	196.80	54.09	44.03	43.6	51.6	54.46	52.30	0.37	8.27
12	Eakharpur	0.23	230	754.40	54.09	44.03	44.8	42.8	54.57	46.47	0.48	2.44
13	Mokalwas	0.14	140	459.20	54.09	44.03	48.1	46	55.07	48.14	0.98	4.11
14	IMT Maneswar	0.13	130	426.40	54.09	44.03	48.5	46.5	55.15	48.45	1.06	4.42
15	Patli Hajipur	0.66	660	2164.80	54.09	44.03	38	35.9	54.20	44.65	0.11	0.62
16	Sultanpur	0.9	900	2952.00	54.09	44.03	35.9	33.9	54.16	44.43	0.07	0.40
17	Badli	0.81	810	2656.80	54.09	44.03	36.6	34.6	54.17	44.50	0.08	0.47
18	Bupania	0.85	850	2788.00	54.09	44.03	36.3	34.3	54.16	44.47	0.07	0.44
19	Daboda Khurd	0.26	260	852.80	54.09	44.03	44	42	54.50	46.14	0.41	2.11
20	Mandothi	0.72	720	2361.60	54.09	44.03	37.4	35.3	54.18	44.58	0.09	0.55
21	Asauda	0.83	830	2722.40	54.09	44.03	36.5	4.4	54.16	44.03	0.07	0.00
22	Jasaur Kheri	0.69	690	2263.20	54.09	44.03	37.7	35.6	54.19	44.61	0.10	0.58
23	Pehladpur Kirholi	0.59	590	1935.20	54.09	44.03	38.7	36.6	54.21	44.75	0.12	0.72
24	Malha Majra	0.21	210	688.80	54.09	44.03	45.4	43.4	54.64	46.74	0.55	2.71
25	Chhatera Bahadurpur	0.54	540	1771.20	54.09	44.03	39.3	37.2	54.23	44.85	0.14	0.82
26	Mandaur	0.37	370	1213.60	54.09	44.03	41.7	39.7	54.33	45.39	0.24	1.36
27	Jagdishpur	0.05	50	164.00	54.09	44.03	54.8	59.6	57.47	59.72	3.38	8.56
B) Hospitals												
1	Sri Sathya Sai Sanjeevani International Centre for Child Heart Care & Research (Baghola)	5.57	5570	18269.60	54.09	44.03	24.1	22	54.09	44.06	0.00	0.03
2	Govt. Hospital - Palwal	12.09	12090	39655.20	54.09	44.03	19	17	54.09	44.04	0.00	0.01

S.No	Village	Distance (km)	Distance (m)	Distance (FT)	Existing Noise		Project Noise		Cummulative Noise		Increased Noise level	
					(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night
3	C.H.C Dudhola Govt. hospital	3.08	3080	10102.40	54.09	44.03	27.9	25.9	54.10	44.10	0.01	0.07
4	Mailk Multispecility (Delhi Alwar Road)	11.73	11730	38474.40	54.09	44.03	19.2	17.2	54.09	44.04	0.00	0.01
5	Civil Hospital - Baluda Rd Rajoria Nagar - Shona	6.27	6270	20565.60	54.09	44.03	23.3	21.3	54.09	44.05	0.00	0.02
6	Anand Hospital (Tauru)	3.33	3330	10922.40	54.09	44.03	27.4	25.4	54.10	44.09	0.01	0.06
7	Civil Hospital - Tauru	4.11	4110	13480.80	54.09	44.03	11.1	9	54.09	44.03	0.00	0.00
8	ESIC Hospital (IMT Manesar Sector 3)	3.63	3630	11906.40	54.09	44.03	26.9	24.8	54.10	44.08	0.01	0.05
9	Park Hospital (Q Block South City 2, Sohna Rd)	17.87	17870	58613.60	54.09	44.03	16.5	14.4	54.09	44.03	0.00	0.00
10	Artemis Hospital Gurgaon (Sector 51)	20.43	20430	67010.40	54.09	44.03	15.6	13.6	54.09	44.03	0.00	0.00
11	Government Hospital - Sohna, Gurugram	3.58	3580	11742.40	54.09	44.03	26.9	24.9	54.10	44.08	0.01	0.05
12	Max Hospital (Near Huda City Centre)	21.11	21110	69240.80	54.09	44.03	15.4	13.3	54.09	44.03	0.00	0.00
13	Aarvy Hospital (Civil Lines Opp Nehru Stadium)	16.11	16110	52840.80	54.09	44.03	17.1	15.1	54.09	44.04	0.00	0.01
14	Civil Hospital_Sector-10 Gurugram	13.5	13500	44280.00	54.09	44.03	18.3	16.3	54.09	44.04	0.00	0.01
15	RS Gaur Global Multispeciality Hospital, Jhajjar	16.7	16700	54776.00	54.09	44.03	16.9	14.9	54.09	44.04	0.00	0.01
16	Oscar Super Specialty Hospital and Trauma Centre- Jhajjar	16.64	16640	54579.20	54.09	44.03	16.9	14.9	54.09	44.04	0.00	0.01
17	Civil Hospital Jhajjar	17	17000	55760.00	54.09	44.03	16.8	14.8	54.09	44.04	0.00	0.01
18	Ujala Cygnus J. K. Hindu Hospital (Old Rohtak Rd near Hindu	4.45	4450	14596.00	54.09	44.03	25.5	23.5	54.10	44.07	0.01	0.04

S.No	Village	Distance (km)	Distance (m)	Distance (FT)	Existing Noise		Project Noise		Cummulative Noise		Increased Noise level	
					(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night	(Leq) day	(Leq) night
	College of Engineering Industrial Area)											
19	Janta Charitable H	5.3	5300	17384.00	54.09	44.03	24.4	22.3	54.09	44.06	0.00	0.03
20	Memorial Hospital (Mama Bhanja chowk Anand Nagar)	5.64	5640	18499.20	54.09	44.03	24	21.9	54.09	44.06	0.00	0.03
21	Haryana Multispecialty Hospital	5.17	5170	16957.60	54.09	44.03	24.5	22.5	54.09	44.06	0.00	0.03
22	Tulip Hospital	5.16	5160	16924.80	54.09	44.03	24.6	22.5	54.09	44.06	0.00	0.03
23	Civil Hospital (Delhi Road, Near Maharana Pratap Chowk)	4.98	4980	16334.40	54.09	44.03	24.8	22.8	54.10	44.06	0.01	0.03
C) School												
1	Mewat Model School, Nuh	3.55	3550	11644.00	54.09	44.03	27	25	54.10	44.08	0.01	0.05
2	GC Senior Secondary School	3.11	3110	10200.80	54.09	44.03	27.9	25.8	54.10	44.09	0.01	0.06

5.4.2.2 Vibration from Operation of Train

The vibration of the transit structure excites the adjacent ground, creating vibration waves that propagate through the various soil and rock strata to the foundations of nearby buildings. The vibration propagates from the foundation throughout the remainder of the building structure. The intensity of vibration depends on operational and vehicle parameters, track system, geology and condition of receiving building. Primary effect of ground borne vibration is rattling of window panes and rumble noise which cause annoyance to the occupants. Vibration prediction is done to find out the vibration levels during operation at habitation near the alignment. No other sensitive receptors are in near the vicinity of the alignment where impact due to the operation will be observed. Vibration prediction depends on frequency of vibration events i.e. less than 70 or more than 70. For prediction the assumptions are: vibration events more than 70 per day, locomotive power freight/passenger train, no stiff primary suspension, no worn or flat wheel/corrugated track, high resilient fasteners, at grade or cut and cover section. Various adjustment factors are applied applicable to the project to arrive at resultant vibration values. Predicted vibration level is presented in the **Table 5.14**.

In India, no criterion has been prescribed in “The noise Pollution (Regulation and Control) Rules, 2000” regarding the limits of ground borne vibrations and noise on account of railway systems. FTA Manual provides for different standards for different frequency of events. As the present project falls under the category of ‘Frequent Events’, which is defined as more than 70 vibration events per day, FTA standards for ‘Frequent events’ are taken as the standard for noise and vibration. These are tabulated in **Table 5.15**.

It is seen that the predicted values are within Impact Criteria values i.e., 72VdB of ground borne vibration and 35 dB(A) of ground borne noise criteria at all locations for residences and buildings where people normally sleep.

Table 5.14: Predicted Vibration Level Due to the Project without Control Measures

S.No.	Village	Distance (km)	Distance (m)	Predicted Vibration	
				Vibration (V dB)	GB Noise dB(A)
1	Asoti	0.19	190	45.7	10.7
2	Jataula	0.13	130	51.7	16.7
3	Pirthala	0.42	420	30.1	0
4	Chhaprola	0.11	110	54.1	19.1
5	Khoontpuri	0.1	100	55.4	20.4
6	Silani	0.22	220	43.2	8.2
7	Karnki	0.34	340	34.8	0
8	Sancholi	0.32	320	36	1
9	Padheni*	0.02	20	69.4	34.4
10	Sheikhpur	0.12	120	52.9	17.9
11	Kalwari	0.3	300	37.3	2.3
12	Fazalwas	0.06	60	61.7	26.7
13	Eakharpur	0.23	230	42.4	7.4
14	Mokalwas	0.14	140	50.6	15.6
15	IMT Maneswar	0.13	130	51.7	16.7
16	Patli Hajipur	0.66	660	18.8	0
17	Sultanpur	0.9	900	9.6	0
18	Badli	0.81	810	12.9	0
19	Bupania	0.85	850	11.4	0

S.No.	Village	Distance (km)	Distance (m)	Predicted Vibration	
				Vibration (V dB)	GB Noise dB(A)
20	Daboda Khurd	0.26	260	40.1	5.1
21	Mandothi	0.72	720	16.3	0
22	Asauda	0.83	830	12.1	0
23	Jasaur Kheri	0.69	690	17.5	0
24	Pehladpur Kirholi	0.59	590	21.8	0
25	Malha Majra	0.21	210	44	9
26	Chhatera Bahadurpur	0.54	540	24.1	0
27	Mandaur	0.37	370	33	0
28	Jagdishpur	0.05	50	63.7	28.7

*Not at at-grade location

Table 50.15: Recommended Criteria for Ground-Borne Vibration & Ground-Borne Noise for General Assessment

Land use category	Ground-Borne Vibration Impact Levels (VdB ref=25.4 μ mm/s)	Ground-Borne Noise Impact Levels (dB ref 20 μ Pa)
Category 1: Buildings where vibration would interfere with interior operations	65 VdB	N/A*
Category 2: Residences and buildings where people normally sleep	72 VdB	35 dB(A)
Category 3: Institutional land uses with primarily day time use	75 VdB	40 dB(A)

*Vibration sensitive equipment is not sensitive to ground-borne noise.

5.4.3 Operation of Stations

Impacts anticipated due to the operation of stations are as follows:

1) Energy Consumption at Stations

Energy is required at stations for facilities like lighting, passenger information, access, security, climate control, escalators/elevators etc.

2) Water Supply, Waste Water and Municipal Waste Disposal at Stations

The water demands will be on station for drinking, toilet, platform washing and cleaning. Water Demand is calculated based on Indian Railway norms which comes out to be about 627 KLD for all the stations. The water requirement for the stations will be met through the public water supply system after taking necessary approvals. Daily sewage flow is considered as 80% of the water requirement hence total sewage generation will be about 501 KLD. Solid Waste generation at each station will be approximately of the order of 65 kg per day considering 50 gm of solid waste generated by each passenger.

3) Traffic Congestion around Stations

Commencement of services will result in passenger rush at stations which in turn will result in congestion around stations.

5.5 POSITIVE IMPACTS

5.5.1 Employment Opportunities

During construction local skilled and unskilled labours will have an opportunity for employment directly or indirectly. Approximately 720 labours are likely to work during peak project construction. In operation phase, about 385 persons will be employed for operation and maintenance of the proposed system. Thus, the project would provide substantial direct employment; besides, more people would be indirectly employed in allied activities and trades.

5.5.2 Benefits to Economy

The project will facilitate movement of people from different parts of Haryana. It will provide connectivity to IMT/Sohna, Manear, Kharkhoda, MET/Reliance, major Automobile manufactures, logistics companies, proposed new Panchgram cities etc. This alignment is mostly along KMP expressway connecting radial routes of Indian Railways. This will provide efficient and faster route for freight traffic in Delhi NCR region. Being High Rise OHE section, HORC will provide seamless “High Speed High Capacity” connectivity for the operation of Double Stack Containers from the Economic centres in NCR to Port of India through DFC network.

5.5.3 Reduction of Traffic and Greenhouse Gas Saving

Due to operation of the project, there will be modal shift. The HORC will transport both passengers and freight. Due to modal shift, there will be saving of Greenhouse gas i.e. CO₂. The basis of reduction of vehicles is shift of ridership from road vehicles to the railway and freight from road to railway. The reduction in number of vehicles also gives benefits to economy by reduction in Vehicle Operating Cost (VOC), Fuel Consumption, Pollution Load, Accidents and Travel Time etc. The estimated numbers of passenger shift and freight along with CO₂ saving is given in Table 5.16.

Table 5.16: Greenhouse Saving

Year	Number of passenger shifted to HORC/IR	Freight estimates for Road to Rail Diverted traffic (in MMTPA)	Baseline Emissions		Project Emissions	Net Emission Savings (tCO ₂ /year)
			Due to passenger Shift (tCO ₂ /year)	Due to freight Shift (tCO ₂ /year)	From passenger and freight transport (tCO ₂ /year)	
2027	19159043	2.837	41868	19063	43334	17597
2032	22151129	4.221	48407	28363	51881	24889
2037	24291534	6.295	53084	42295	58051	37328
2042	26774041	9.406	58509	63202	64649	57062
2047	29662545	14.082	64821	94623	73186	86258
2052	33033183	21.121	72187	141917	84368	129736
Total			338876	389463	375469	
Average per Annum						58811

5.6 IMPACT MATRIX

Impacts identified from the proposed activities are further rated on the basis of nature significance and extent of the impacts. R1 rating is for the significant negative impact. R2 rating is given for those impacts that have some negative impact. R3 is for those whose extent of impact is unknown and R4 is given to those which have not any impact on the environment. The Impacts due to the proposed project and their brief description along with rating are given in Table 5.17

Table 5.17: Rating of Environmental Impacts

S. No	Parameter	Impact Rating	Short Term / Long Term
A.	IMPACTS DUE TO PROJECT LOCATION AND DESIGN		
1.	Displacement and loss of livelihood of Project Affected People (PAPs)	R1	Long term, permanent, negative, irreversible, can be mitigated, scale to be evaluated.
2.	Change of Land use	R2	Long term, permanent, negative, irreversible, can be mitigated, small scale.
3.	Impact on terrestrial ecology	R1	Permanent, negative, irreversible, can be mitigated, Medium scale.
4.	Drainage and Utilities: Diversion/shifting	R2	Short term and permanent, negative, irreversible can be mitigated; small scale.
5.	Impact on Archaeological Monuments and Heritage Assets	R4	No impact
6.	Alignment: <ul style="list-style-type: none"> • Route and design of alignment • Stations, Track design and Architecture 	R2	Long term, permanent, negative as well as positive, irreversible & can be mitigated, small scale.
7.	Inter Modal Integration	R2	Long term, negative as well as positive, irreversible, can be mitigated, small scale.
8.	Use of Energy and Water at stations and depots	R2	Long term, permanent, negative, irreversible & can be mitigated, small scale.
9.	Risk Due to Natural Hazards	R4	Permanent, negative, irreversible & can be mitigated, small scale.
B.	IMPACTS DUE TO PROJECT CONSTRUCTION		
1.	<ul style="list-style-type: none"> ➤ Air pollution: <ul style="list-style-type: none"> • Particulate air pollution due to activities like excavation; • Emissions due to transportation of muck and material ➤ Noise, Vibration 	R1	Temporary, negative, reversible except in severe cases like death or building failure, can be mitigated, small scale.
2.	Disposal of muck, C&D waste and hazardous waste; pre-casting and material yards	R2	Permanent, negative, irreversible, can be mitigated, small scale.
3.	Water demand and water quality	R1	Temporary, negative, reversible, can be mitigated, small scale.

S. No	Parameter	Impact Rating	Short Term / Long Term
4.	Impact on terrestrial ecology	R1	Permanent, negative, irreversible, can be mitigated, medium scale.
5.	Soil erosion and land subsidence	R2	Temporary, negative, irreversible, can be mitigated, small scale.
6.	Traffic diversions	R2	Temporary, negative, reversible, can be mitigated, small scale.
7.	Labor camp and on-site labour safety/ welfare	R1	Temporary, negative, reversible, can be mitigated, small scale.
8.	Supply of construction material	R2	Temporary, negative, irreversible, can be mitigated, small scale.
C.	IMPACTS DUE TO PROJECT OPERATION		
1.	Noise and Vibration	R2	Permanent, negative, irreversible, can be mitigated, small scale.
2.	Energy and water supply at stations	R2	Permanent, negative, irreversible, can be mitigated, small scale.
3.	Traffic congestion around stations	R2	Permanent, negative, reversible, can be mitigated, small scale.
D.	POSITIVE IMPACTS DUE TO PROJECT		
1.	Employment Opportunities	Positive impact	Permanent, positive, small scale.
2.	Benefits to Economy: access, reduced costs of road infrastructure, vehicle operating & time, accidents.	Positive impact	Permanent, positive, large scale.
3.	Reduction in road traffic, fuel consumption and air pollution, GHG emission	Positive impact	Permanent, positive, large scale.

Rating: R1: Significant negative impact is expected. R2: Some negative impact is expected. R3: Extent of impact is unknown R4: No impact is expected.

5.7 CUMULATIVE IMPACT

The proposed alignment is most efficient, sustainable, and eco-friendly sources of transportation. Along the proposed alignment from Palwal to Sonipat with construction of station/ cabins etc., major impact during construction phase and partly during operational phase will be related to Air, Noise, Land, Water, Biological, Socio-economics & Climate change. The Impacts are represented using the matrix method as tabulated in **Table 5.18**. Further quantification for cumulative impact is done using numerical scores range from 0 to 5 as per the following criteria in **Table 5.19**. The total negative impact of various activities on any one parameter is represented as a cumulative score given in **Table 5.20** and the cumulative scores of various parameters are given in the form of a cumulative impact chart given in **Table 5.21**. Any particular parameter having an individual score greater than 4 or cumulative score of 20 implies serious effects due to the project and calls for suitable mitigation measures. It is evident from the matrices that the resultant impact is beneficial to the local population and due to export and import substitution the resultant impact is beneficial to our country.

Table 5.18 Impact Identification Matrix

Parameter	Air Quality	Noise Quality	Water Quality	Land Use	Infrastructure	Terrestrial Ecosystem	Socio Economic Status	Aquatic Ecology
Activities	Construction Phase							
Water Requirement	No	No	Yes	No	No	Yes	Yes	Yes
Equipment failures	Yes	Yes	No	No	No	No	No	No
Transportation	Yes	Yes	No	Yes	No	No	No	No
Resource Consumption	Yes	No	Yes	Yes	No	No	No	No
Activities	Operation Phase							
Water Requirement	No	No	Yes	No	No	No	Yes	Yes
Equipment failures	Yes	Yes	Yes	No	No	No	No	No
Transportation	Yes	Yes	No	No	Yes	No	Yes	No
Resource Consumption	No	No	Yes	Yes	Yes	No	No	No

Table 5.19: Numerical Scores Range for Impact Rating

Score	Severity Criteria
0	No impact
1	No damage
2	Slight/ Short-term effect
3	Occasional reversible effect
4	Irreversible/ Long-term effect
5	Permanent damage

Table 5.20: Environmental Impact Matrix

Parameter	Air Quality	Noise Quality	Water Quality	Land Use	Infrastructure	Terrestrial Ecosystem	Socio Economic Status	Aquatic Ecology
Activities	Construction Phase							
Water Requirement	0	0	3	0	0	2	2	2
Equipment failures	2	2	0	0	0	0	0	0
Transportation	2	2	0	1	0	0	0	0
Resource Consumption	1	0	2	2	0	0	0	0
Activities	Operation Phase							
Water Requirement	0	0	1	0	0	0	2	3
Equipment failures	2	1	1	0	0	0	0	0
Transportation	1	2	0	0	1	0	1	0
Resource Consumption	0	0	2	1	1	0	0	0

Table 5.21: Cumulative Impact Chart

Environmental Parameter	Total Cumulative Score (Construction)	Total Cumulative Score (Operation)
Water Requirement	9	6
Equipment failures	4	4
Transportation	5	5
Resource Consumption	5	4
Total Score	23	19

Significance of impacts can be calculated based on Cumulative Score. The maximum cumulative score are **23 and 19**. The significance has been calculated as below:

- **0 to 10:** Adequate
- **10 to 15:** Adequate
- **15 to 20:** Inadequate
- **20 to 25:** Inadequate

It is seen from the **Table 5.21**, cumulative impact chart that the cumulative score of each of the environmental parameters for all activities are well within the limit. Therefore it is concluded that, if the proper mitigation measures are taken for identified impacts, no adverse cumulative impact is envisaged due to proposed project. Potential impact and mitigation measures of operation are given in **Table 5.22**.

Table 5.22 Potential Impact and Mitigation Measures

Likely Impacts and associated risks			
Issue	Impacts	Explanation	Possible mitigation measures
During Pre-Construction Phase			
Alignment will pass through mostly irrigation canal and a nalla at different chainage.	(+) favorable	Possibility of water withdrawal source during construction phase only.	Withdrawal of water from irrigation canal will be done in scientific manner.
The alignment will pass through many water bodies including irrigation canal and pond.	(+/-)	Air (dust) & Noise pollution during Construction phase.	Negligible impact To control dust, barrier like screen or wind fences & water sprinklers will be employed. For noise control physically attached shields on stationary equipment, dampeners on vibrating equipment, sound aprons attached to the equipment & sound enclosures at site will be employed.
Wetland, migratory birds and biodiversity	(-)	Project alignment will pass through eco sensitive zone and it may impact adjoining wetland, migratory bird centers, bio-diversity of the area.	Conservation plan is proposed in EMP for the wetland, migratory birds and scheduled species.
During Construction Phase			
Dust emission	(-)	Dust will impact biotic	Minimal Impact.

Likely Impacts and associated risks			
Issue	Impacts	Explanation	Possible mitigation measures
		and abiotic component of the study area.	Dust suppression plan will be carryout as per EMP.
Water Resources	(-)	Increase demand for water	Provision of rain water harvesting and artificial recharge.
Measures to prevent air, water, soil and noise and health pollution impact on worker and communities	(-)	Preventive measures taken for avoid such risks	Insignificant, as it is proposed to enforce the preventive measures as a part of clauses in the contract agreements.
Carbon Emission	(+) favorable	Project will have significant level of positive impact in reducing the carbon emission	Carbon credit benefit of the project will be estimated and will be part of enhancement measures
Climate Change	(+) favorable	Project will have positive impact on reducing GHG emission and hence reduce the risk of climate change	Climate resilience plan is given in ESIA to scope up with climate change at project level
Special social concern due to project	(+) favorable	HIV/AIDS spread possibility; poor labor camps hygiene and health condition of labor and issues, gender violence behavior and stress on vulnerable groups.	RP and SMP will provide the measures for such issues and probable negative impact and also the mechanism for its effective implementation during the pre and during construction phase.

Impacts and associated risks During Operation Phase			
Issue	Impact	Explanation	Possible mitigation measures
Hydrological impacts			
Availability of flows to the canal	(+) favorable	Project measures relating to rainwater harvesting technology and artificial recharge will improve the groundwater deteriorating condition in the area	Rainwater harvesting and artificial groundwater recharge measures will be adopted at suitable locations.
Water quality impacts			
Toxic substances	(+) Favorable	Project will indirectly improve the water quality due to reducing waste during travel and increasing groundwater recharge	Waste management plan is place
Soil quality impacts			
Soil Properties	(+) Favorable	Project will reduce the travel time and hence the waste load. Hence its impact on the soil properties will be favorable	Soil type and properties in the project-affected area is identified and its impact will be assessed in ESIA

Impacts and associated risks During Operation Phase			
Issue	Impact	Explanation	Possible mitigation measures
Local soil erosion	(+) Favorable	Project will be cause for more regulated drainage and improved hydrological condition and hence may have positive impact on soil erosion en-route	Soil erosion impact is assessed
Scheme area and land use	(+/-)	New or modernization schemes radically affect the demographical and land use pattern.	Impact of the changes is to be assessed and is to be studied through ESMP
Water bodies, Wetland, migratory birds and bio-diversity	(+/-)	Negative impact is expected	Mitigation measures will be identified and studied through ESIA/ESMP and implemented and monitored
Human health	(+)	Project will reduce the GHG emission and hence will have positive impact on human health.	Public health enhancement plan is part of ESMP
Climate Change	(+)	Project will have significant level of impact on reducing GHG emission and hence on positive contribution for climate change and add feather in country efforts for climate change towards Paris Agreement.	ESIA study formulated ESMP will further enhance the project capability for climate change risk reduction
Socio-economic impacts			
Travel Time	(+)	Project will reduce the travel time and hence add human productivity.	ESMP will identify and highlights such benefit at micro as well as macro level
Income and employment Generation	(+)	Project will provide direct employment to skilled and semi-skilled workers. Moreover, the commercial activities en-route will be hiked significantly and project will have multiplier effect on the local and regional economy as well as positive impact on NCR GDP	ESIA identify and highlight such benefits.
Income Saving	(+)	Project will enable project beneficiaries and traveller to reduce the travel cost and hence promote income saving	ESIA identify and highlight such benefits.
Vulnerable groups	(+)	Local and regional economy boom due to project will have positive impact on the vulnerable group of project affected as well as project beneficiaries.	Socio-economic study of the area can identify such communities and suggest livelihood restoration and enhancement plan

5.8 SOCAIL IMPACTS

Negative Impacts

The proposed HORC project shall have negative impact on loss of land, loss of structures, Impact on Households and Persons, loss of livelihood, impact on women, Impact on Vulnerable Groups and impact on community

resources. During socio- economic survey 4.2% respondents showed concern for loss of income, while 2.6% expressed that by acquisition land, pressure on infrastructure will increase.

District wise Social Impacts of the Project

The district wise social impacts of the project are given in **Table 5.23**.

Table 5.23: District wise social impacts of the Project

Impact	Palwal	Nuh	Jhajjar	Gurugram	Sonipat	Total
Acquisition of Land (in Ha)	17.15	192.3	172.33	203.11	112.37	765.734
Private Land (in Ha)	15.75	151.6	165.42	115.74	81.105	530.0
Government Land (in Ha)	1.4038	40.67	6.91	87.37	31.26	236.734
Impact on Structures (no)	33	113	71	109	45	371
Total PAHs	1243	2177	1306	3918	1245	9889
Total PAPs	6277	11595	4446	17077	4534	43908
Titleholder (no)	1243	2175	1306	3916	1245	9885
Non-Titleholder (no)	-	2	-	2		4
Loss of Residence (no)	2	7	2	7	1	19
Loss of Business (no)	3	4	2	6	2	17
Vulnerable PAHs (no)	12 2	41	5	312	11	491

Source: Field Survey data by OMTIC Team, June 2021

Note: All elderly peoples above 60 years age are land holders and they do not belongs to vulnerable group as per social assessment carried out in the feild.

Impact on Land

The proposed HORC project will be requiring land for different purposes. Land is mainly required for formation and construction of rail tracks, stations, passenger amenities, parking, circulation area, overhead equipment and other activities.

As per the DPR, land area required for the construction of the project is assessed to be around 655.92 hectares, of which 70 hectares of land area is under Haryana State Industrial & Infrastructure Development Corporation(HSIIDC), 8 hectares of land area is under Indian Railways and 19.67 hectares of land area is under DFCCL. Approximately 558.25 hectares of land is under private ownership(Table 2.5). As per 20 A Notification of the Railways Act, 1989 for land acquisition, 1072.76 hectares is required for acquisition. 20A Notification is basically issued for intention of land acquisition for the project. No government and private land is classified. As per 20E Notification, the project requires 526.606 hectares of private land and remaining 236.1272 hectares of Government land in which 129.91 hectares is under HSIIDC, 13.4748 hectares is under Indian Railways, 18.3116 hectares is under DFCCL, 36.7308 hectares is under KMP, 8.58 hectares is under road, 28.55 hectares is under Panchayat and 0.57 hectare is under Canal/Drain. No land will be acquired for temporary purpose. The

total land requirement as per 20 E has been reduced from a total of 1073 ha to 765.734 ha (i.e., by 28.6% approximately). Table 5.24 gives land requirement as per DPR,20A and 20E Notifications.

Table 5.24: Land Requirement as per DPR,20A and 20E Notification

Description	Area (Ha)
Land requirement as per DPR	
IMT Sohna (Already acquired by HSIIDC)	10.00
IMT Manesar (Already acquired by HSIIDC)	38.00
IMT Kharkhoda (Already acquired by HSIIDC)	22.00
Available DFCCIL Land	19.67
Available Railway Land Requirement at Connection to Existing Station	8.00
Net Private Land requirement as per DPR	558.25
Total Land requirement	655.92
Land required as per 20A Notification	
20A notification generally taken on a relatively higher basis to reduce the need for publication of these notifications for additional land requirement land.	1073 (Govt. and Pvt.)
As Per 20E Notification	
HSIIDC	129.91
Road	8.58
Panchayat	28.55
Canal/Drain	0.57
Railway land requirement at Connection to Existing Station	13.4748
DFCC	18.3116
KMP	36.7308
Net Private Land requirement	529.606
Total Land requirement	765.734

Impact on Households and Persons (Title Holders and Non-Title Holders)

Table 5.25 shows that the projects will affect 9885 title holders. Total project affected Families are 12,087 (belonging to Titleholders) and 43887 project affected persons (belonging to Titleholders).

Table 5.25: District wise Number of PAHs & PAFs (Title Holders)

District	Title Holders		
	PAHs	PAPs	PAFs
Gurugram	3916	17067	4,157
Jhajjar	1306	4446	1,541
Nuh	2175	11584	3,112
Palwal	1243	6277	1,824
Sonipat	1245	4534	1,436
Total	9885	43,887	12,087
Land Plots	9885		

Source: Field Survey data by OMTC Team, June 2021

Table 5.26 shows that there are four Non-Title Holder PAHs consisting of 21 persons. Among the non-title holders three are kiosks and one is tenant.

Table 5.26: District Wise Number of PAHs (Non-Title Holders)

NTH	Gurugram	Jhajjar	Nuh	Palwal	Sonipat	Total
Tenant	1	-	-	-	-	1
Kiosk	1	-	2	-	-	3
Encroachers	0	0	0	0	0	0
Squatters	0	0	0	0	0	0
PAPs	10	-	11	-	-	21
PAHs	2	-	2	-	-	4

Source: Field Survey data by OMTC Team, June 2021

Land Holding size of Private Land Plots

Table 5.27 gives the land holding size in each District. 72.7% of land plots are below 1 Acre, 18.5 % hold the land plot of size between 1 to 5 Acres whereas only 5.2% hold between 5 to 10 Acres only 0.3% of PAH hold land plots of more than 25 Acres area.

Table 5.27: District wise Land holding size of PAH

District	Others	Below 1Acre	1-5 Acre	5-10 Acre	10-15 Acre	15-20 Acre	20-25 Acre	Above 25Acre	Total	%
Gurugram	150	3235	326	171	22	8	0	4	3916	39.6
Jhajjar	0	326	683	236	32	1	13	15	1306	13.2
Nuh	39	2006	128	1	0	1	0	0	2175	22.0
Palwal	3	1139	76	11	4	6	2	2	1243	12.6
Sonipat	17	487	612	95	16	11	0	7	1245	12.6
Total	209	7193	1825	514	74	27	15	28	9885	100
%	2.1	72.8	18.5	5.2	0.7	0.3	0.2	0.3	100	

Source: Field Survey data by OMTC Team, June 2021

Impact on Structures, its Category & Typology

District wise structures impacted are given in **Table 5.28** indicating impact of the proposed project on the different types of structures i.e., residential, commercial, boundary wall, borewell, tube well, godown/storage cattle shed and other types. There are 371 structures impacted among them 19 are residential, 14 commercial, 73 Borewells /wells, 87 floor ramps, 44 chabutras, 9 stairs and 122 boundary walls. Photos of structures impacted are given in **Annexure 5.4**.

Table 5.28: District Wise Structures Impacted

Name of District	Floor/Ramp	Wall	Resi.	Comm.	Chabutra	Stair	Kiosk	Wells/Borewell	Total
Palwal	5	7	2	3	3	1	-	12	33
Nuh	28	38	7	2	19	3	2	14	113
Gurugram	25	41	7	5	16	5	1	9	109
Jhajjar	16	23	2	2	3	-	-	25	71
Sonipat	13	13	1	2	3	-	-	13	45
Total	87	122	19	14	44	9	3	73	371

Source: Field Survey data by OMTC Team, June 2021

Table 5.29: Typology and Area of the Structures Impacted

Name of District	Pucca Structure		Semi-pucca		Kutchha		Other structures		Total Number
	No.	Area in sq m	No.	Area in sq m	No.	Area in sq m	No.	Area in sq m	
Palwal	13	5652.2	5	723.3	10	-	4	93.2	32
Gurugram	84	31087.0	19	-	7	120.6	2	326.0	112
Nuh	85	29673.9	14	1234.6	5	299.4	2	308.6	106
Jhajjar	55	42391.3	15	-	3	-	2	218.3	75
Sonipat	40	21195.7	2	742.1	2	-	2	133.9	46
Total	277	130000	55	2700	27	420	12	1080.0	371

Source: Field Survey data by OMTC Team, June 2021

Table 5.29 shows 277 Pucca structures having an area of 130,000 sq m, 55 Semi-pucca structures having an area of 2700 sq m and 27 Kutchha structures having an area of 420 sq m and 12 other structures like Sheds, Gowshala, poultry Farm and Kheli having an area of 1080 sq m in the HORC alignment that will be impacted.

Magnitude of Impact of Structures

District wise magnitudes of Impact on structures are given in **Table 5.30**. The magnitude of impact in Palwal District on 2 Houses is about 50-75%, on 2 Boundary walls more than 25% and on 6 Bore wells is between 75-100%. The magnitude of impact in Nuh District on 7 Houses, 3 Boundary walls, 2 Shops, 26 Bore wells, 1 Dhaba and 9 other structures is between 75-100%. The magnitude of impact in Gurugram District on 2 Houses, 7 Boundary walls, 1 Factory, 1 Bore well and 2 other structures are between 25-50%. Magnitude of impact one borewell are between 50-75%, whereas 4 Houses, 1 shop, 1 Boundary walls, 16 bore wells, 1 Factory and 13 other structures are between 75-100%. The magnitude of impact in Jhajjar District on 1 House are between 0-25%, while 2 Houses, 2 Petrol Pumps, 1 School and 5 other structures is between 25-50%. The magnitude of on 1 House, 2 Shops, 1 Boundary wall, 18 Bore wells, 2 factories and 18 other structures are between 75-100%. The magnitude of impact in Sonipat District on 1 House, 22 Bore wells and 14 other structures are between 75- 100%.

Table 5.30: District Wise Magnitude of Impact on Structures

S.No	District	Name of Structure	Magnitude of Impact			
			0 - 25%	25 - 50%	50 - 75%	75 -100%
1	Palwal	House	-	-	2	-
		Boundary wall	-	1	-	1
		Bore -well	-	-	-	6
Total			-	1	2	7
2		House	-	-	-	7

S.No	District	Name of Structure	Magnitude of Impact			
			0 - 25%	25 - 50%	50 - 75%	75 -100%
1	Palwal	House	-	-	2	-
		Boundary wall	-	1	-	1
		Bore -well	-	-	-	6
Total			-	1	2	7
	Nuh	Shop	-	-	-	2
		Boundary wall	-	-	-	3
		Bore -well	-	-	-	26
		Hotel/ Dhaba	-	-	-	1
		Others	1	-	-	9
Total			1			48
3	Gurugram	House	-	2	-	4
		Shop	-	-	-	1
		Boundary wall	-	7	-	1
		Bore -well	-	1	1	16
		Company/Factory	-	1	-	1
		Others	-	2	-	13
Total			-	13	1	36
4	Jhajjar	House	1	2	-	1
		Shop	-	-	-	2
		Boundary wall	-	-	-	1
		Bore -well	-	-	-	18
		School	-	1	-	-
		Company/Factory	-	-	-	2
		Others	-	3	-	18
Total			1	10	-	42
5	Sonipat	House	-	-	-	1
		Bore -well	-	-	-	22
		Others	-	-	-	14
Total						37

S.No	District	Name of Structure	Magnitude of Impact			
			0 - 25%	25 - 50%	50 - 75%	75 -100%
1	Palwal	House	-	-	2	-
		Boundary wall	-	1	-	1
		Bore -well	-	-	-	6
Total			-	1	2	7
Source: Field Survey data by OMTC Team, June 2021						

Impact on Public Amenities/Community Structures

Impact on public amenities plays the vital role in project. The sentiments of people attached with the community structures like temple, samadhi, statue etc. There are 18 structures along the alignment. 4 temples, 4 samadhis and one IOCL pipeline are saved due to minor changes of alignment and flying over through structure. 6 ponds are required to be filled and these ponds are man-made surface water storage structures. The owners of these structures will be compensated as per the Entitlement Matrix. One tower is required to be shifted. The details of the same have been elaborated in **Table 5.31**, and in **Annexure 5.5**.

Table 5.31: Type of Public Amenities/Community Structures

S. No.	Head	Number	Impact	Measures to save the structure
1	Pond	6	Fully affected	Filled
2	Temple	4	Boundary wall partially affected	Flying over the corner of temple through structure.
3	Bhumiya	2	Fully affected	Will be Shifted from land boundary in consultation with Sarpanch and local people.
4	Samadhi	4	Not affected	Flying over through structure
5	IOCL Pipeline	1	Not affected	Flying over through structure
6	Tower	1	Fully affected	Will be Shifted from present location in consent with the owner
Total		18		
Source: HRIDC, Nov 2021				

Impact on Agricultural Crops

Due to the land acquisition plan in the proposed five districts viz., Palwal, Nuh, Gurugram, Jhajjar and Sonipat it has been estimated that production of important Rabi crops like wheat, millet and maize and Kharif crops like soybean, pulses & cereals will decrease in area of about 460.165 Ha thus will impacts the productivity of crops from the region. **Table 5.32** gives the loss of income for one year for these crops on private land. It is observed that the maximum revenue is generated from Wheat and Rice. Details regarding the crops are given in **Annexure 5.6**.

Table 5.32: Cost of Kharif and Rabi Crops on Private land for one Year

S. No.	District	Private	Kharif Crop Cost as per MSP 2020-2021				
		Land (in Hectare)	Rice	Bajra	Cotton	Jowar	Pulses
1	Palwal	15.7448	7661641	5613575	0	1237544	0
2	Gurugram	112.21	0	27300064	0	8819720	0
3	Jhajjar	99.5048	210435167	27308843	0	7821077	8213833
4	Sonipat	81.1046	33013868	33207968	97850632	6374824	0
5	Nuh	151.6	0	43255542	0	11915772	0
Total		460.165	251110676	136685992	97850632	36168937	8213833
Cost in Crores			25.1	13.7	9.8	3.6	0.8
Cost of Rabi Crops							
S. No.	District	Private land	Rabi Crop Cost as per MSP 2020-2021 in Rs				
		Land (in Hectare)	Wheat	Rapeseed & Mustard	Gram	Barley	
1	Pawal	15.7448	127251214	5451474	0	556737	
2	Gurugram	112.21	906893352	11797386	0	978473	
3	Jhajjar	99.5048	804207230	50262809	19639262	647975	
4	Sonipat	81.1046	655495355	91425442	0	0	
5	Nuh	151.6	1225246867	31757580	0	5241727	
Total		460.165	3719094018	190694691	19639262	7424912	
Cost in Crores			371.9	19.1	2.0	0.7	
Source: Field Survey data by OMTC Team							

Impact on Sharecropper and Wage Labour

The land acquisition for the project will have various impacts on different cross section of people apart from affected peoples like sharecroppers, wage labour and vulnerable families whose livelihood are based on the earning from land. As per the survey few sharecroppers and some vulnerable families has been reported who will face higher risk of falling into poverty than others in an adverse situation as they are poor, assetless & do not have enough land, or adequate employment to support the family. Thus, these families should be taken into consideration as per the RFCTLARR act during the process of making compensation. This information will be updated at the time of verification.

Impact on Trees

Table 5.33 shows that about 6499 numbers of trees will be felled down in the five Districts. The highest number of Trees to be felled is in Gurugram and the lowest is in Palwal district. Trees details are given in **Annexure 5.7**.

Table 5.33: District Wise Trees Impacted

S. No.	Name of District	Forest Tree	Govt. Tree	PVT Tree	Barren Land	Total Number of trees to be cut
1	Palwal	7	0	68	0	75
2	Nuh	99	2	626	0	727
3	Gurugram	120	1879	551	38	2588
4	Jhajjar	84	16	439	0	539
5	Sonipat	106	942	1522	0	2570
Total		416	2839	3206	38	6499

Source: Field Survey data by OMTC Team, June 2021

Impact on Livelihood/Business

A total number of 9,871 household's livelihood will be affected due to acquisition of land as majority of them have agriculture as their occupation. 14 households loose their commercial structures and 4 non-Titleholders will relocate themselves. As regard to RoW, impact on majority of cultivation land is envisaged and lesser on structure loss/damage. Thus, livelihood support to the project affected families at initial state should be provided and taken care by project proponent.

Impact on Vulnerable Families/Persons

As per the AIB guidelines vulnerable group/persons are those with challenges that make them at higher risk of falling into poverty compared to others in the projects area. The Vulnerable Group/ Persons the following categories: (i) PAFs falling under 'Below Poverty Line' (BPL) category²; (ii) persons who belong to Scheduled Castes (SC) and Scheduled Tribes (ST); (iii) Female Headed Family/Household (unmarried women, separated/divorced, widow, etc.); (iv) Elderly people above the age of 60 years and living alone without direct support; and (v) People with disabilities or orphan. The proposed project shall affect total 491 vulnerable households. Out of 491 vulnerable, 42.0% belong to SC, 32.4 % are BPL and 25.6 % are WHH. Highest vulnerable people are living in Gurugram District 63.5 %. Details of vulnerable population identified are given in **Table 5.34**.

Table 5.34: Impact on Vulnerable Households

District	BPL	SC	ST	WHF/H*	Total	%
Palwal	34	47	0	41	122	24.8
Nuh	5	34	0	2	41	8.4
Gurugram	114	125	0	73	312	63.5

² Poverty line as defined by GOI.

District	BPL	SC	ST	WHF/H*	Total	%
Jhajhar	5	0	0	0	5	1.0
Sonipat	1	0	0	10	11	2.2
Total	159	206	0	126	491	100
Percentage	32.4	42.0	0.0	25.6	100	

Source: Field Survey data by OMTC Team, June 2021

Note: All elderly peoples above 60 years age are land holders and they donot belongs to vulnerable group as per social assessment carried out in field.

Impact on the People in Adjacent Area

Positive as well as negative impacts could be seen during and after the implementation of the project. It is seen that the infrastructure project give negative impact only during implementation of the project like taking long routes due to traffic diversion, temporary unavailability of vendors etc. during track construction. After implementation of the project the people living in the adjacent area get the benefits of the project.

Summary of Impacts

In this section the description of impact due to project has been summaries to understand the overall impact due to implementation of the project. In bellow **Table 5.35** the details on PAH, area of land to be acquired, number of CPRs has been given.

Table 5.35: Summary of Social Impacts

S. No.	Head	Number
1	Number of Districts (Palwal, Nuh, Gurugram, Jhajhar and Sonipat)	5
2	Number of Villages	88
3	Area of Land to be Acquired (in Ha)	765.734
4	Private Land Area (in Ha)	236
5	Government Land Area (in Ha)	170
6	Private Land plots	9885
7	Government Land plots	37
8	Gram sabha/Panchayat Land (in Ha)	29
9	Number of Private Structures	388
10	Number of CPRs	18
11	House Holds of Titleholders	9885
12	Households of non-Titleholders	4
13	Number of Vulnerable HH	491

S. No.	Head	Number
14	Number of Project affected Families	12091
15	Project Affected Persons	43908
16	Residential Structures	19
17	Commercial Structures	14
18	Trees Impacted	6499
Source: Field Survey data by OMTC Team, June 2021		

STAKEHOLDER CONSULTATIONS AND ENGAGEMENT PLAN

6.1 GENERAL

ESIA Consultant carried out public consultations with the local communities, affected households, villages/settlements through which the proposed HORC project transverses. These consultations were carried out in addition to the identification of the environment and social impacts being enlisted due to the project development. The initial stakeholders consultations regarding project information were carried out between HRIDC and various stakeholders on **13.02.2019** at Gurugram (**Annexure- 6.1**).

During these public consultations environment impacts were enlisted with discussion of issues regarding nature of project and its features, impacts on account of land acquisition, loss of structures and policy frameworks governing project implementation, key impacts on environmental components. Mitigation measures were disclosed and related suggestions/issues/concerns were recorded.

In accordance with the AIIB requirements and ESIA study Terms of Reference (ToR), these consultations were carried out in all project affected villages. For public consultation in all affected villages, prior permission from Deputy Commissioner was obtained.. The permission letter has been attached as **Annexure- 6.2**. The photographs of public consultation are attached as **Annexure- 6.3**. The issue rose during public consultation along with recommendations and suggestion from affected villages and HRIDC is given in **Annexure- 6.4**.

6.2 OBJECTIVES

The main objective of the public consultations is to provide awareness about the project development and gather suggestions on any adverse impacts due to the proposed development so as to either avoid or mitigate the adverse impacts through appropriate design. In addition to this the other objectives include:

- a) To provide a forum to the community and project personnel in effectively Implementing the project physical interventions;
- b) To create confidence amongst the community about the implementing agency, i.e., Haryana Railway Infrastructure Development Corporation. (HRIDC) to get the community's trust for a social license to operate;
- c) To understand local environment and socio-cultural issues so that any adverse impact to these in particular is addressed under the project at both levels, one at the design level and other at the implementation level;
- d) To engage the community in receiving inputs about the project; and identify alternative design options to either avoid or mitigate adverse environment and social issues.

6.3 STAKEHOLDERS IN HORC PROJECT

Stakeholders include persons or groups directly or indirectly affected by the project, as well as those who may have interest in the project and/or can influence its outcome, either positively or negatively. As part of the ESIA study, the mapping of key stakeholders was done based on discussion with land owners who will be affected by this land acquisition, Government Department officials i.e. Gram Sewak, Patwari, Railway Engineers etc. A sincere attempt was made to have discussion with all key stakeholders in person. This process was also used as an opportunity to collect relevant primary data for strengthening socio-economic baseline of the project study area. The village wise consultations were done wherein consultation with community and PRIs, household interviews and Focus

Group Discussions with affected families, and formal meetings with PRIs and officials concerned were carried out in structured manner.

ESIA consultant has identified primary and secondary stakeholders for the proposed project. Consultations have been done only with primary stakeholders. Consultation at District level will be carried out with both primary and secondary stakeholders after draft ESIA and RP reports. The key stakeholder groups that may have interest in HORC project and/or can influence its outcome, either positively or negatively is given in **Table 6-1**. This list of stakeholders is likely to expand/change in composition as the project moves. It will be updated regularly throughout the project life as appropriate.

Table 6.1: Key Stakeholders with interest in HORC Project

Primary Stakeholders	Secondary Stakeholders
<ol style="list-style-type: none"> 1. Project Affected Families – Land Owners, Non-Title Holders, PRIs 2. Farmers 3. Women Group 4. Vulnerable Group (Women head of the house holds, BPL, Disabled and persons above 60 years of age) 5. Community members Stakeholders at project impact zone 	<ol style="list-style-type: none"> 1. State Government-District administration and Line departments, HRIDC, HSIIDC, GMDA 2. Central Government-Indian Railways, DFCCIL, RITES, NHAI, Revenue and Land Records Functionaries 3. Lender-AIIB 4. Maruti Suzuki India Limited, Alcargo Logistic 5. Local NGOs/CBOs, Trust, Educational Institutions

6.4 METHODS OF PUBLIC CONSULTATIONS

Keeping in mind the objective of minimizing adverse impacts and the need of the stakeholder's participation for the smooth implementation of the project, consultation with the members of different sections of society, the affected households/people, farmers, women groups, vulnerable groups including women headed households, community members of the project area along the proposed rail alignment were carried out. The consultations with vulnerable people were carried out with the aim of building awareness among them so that likely potential adverse impacts of the project on the target vulnerable population may be minimized. In this regard consultation meetings were organized at 88 villages of five districts. The following methods were adopted for conducting public consultations:

- Public meetings/consultations at Village level
- Focus Group Discussions (FGD) with different groups of affected people including residential groups, farmers, women group, and vulnerable groups in the project area.
- Discussions and interviews with key informants

6.5 CONSULTATIONS DURING ESIA STAGE

Consultations were held in 88 villages of 5 districts. Major focus of these consultations was information dissemination about the project, involving people in the ESIA process, take their concerns/suggestions/views about the project and understand their opinion and preferences in ESMP planning. The following information were disclosed during consultation:

1. Detail about the project and its alignment;
2. The land and structures to be acquired and their locations was made clear;
3. Specific Environmental and social issues;
4. Extent of likely adverse impacts due to the project from both environment and social perspectives;
5. Benefits and problems faced if any from the existing corridor;
6. The provisions in RFCTLARR and the method of compensation for loss of structures, land, trees, crops and CPRs. The time frame of settlement;
7. Incase of grievance whom to approach and the structure of GRM etc;
8. Disclosure of RPF.

Besides these consultations during survey, there have been continuous dialogues with the villagers during finalization of alignment and land acquisition process. The information dissemination and consultations were also done after 20 A notifications. However, consultation at district level will be conducted after finalization of draft ESIA Report.


6.6 CONSULTATIONS CONDUCTED IN PROJECT AFFECTED DISTRICTS

As part of participatory approach, qualitative information was gathered through meeting with villagers, focus group discussions with various groups and other key stakeholders along the project alignment. Village level consultations were carried out in all 88 villages of the five districts i.e., Palwal, Nuh, Gurugram, Jhajjar and Sonipat along the proposed HORC Corridor. District and Tehsil wise issues raised and suggestion given by participants are given in **Table 6- 2**.






Table 6.2: Consultations Held in The Five Districts

Particulars	Issues	Suggestions by participants
District Palwal		
Number of Villages :5 Consultation held Between: 11/03/21 to 23/03/21 Participants: Project Affected Families	1. Compensation	Demand for fair and equal compensation. Compensation towards property/ structural loss. Compensation for demolition of house and earliest one time compensation. Compensation should be given at one time. Required compensation for tree on affected land.
	2. Safety of Irrigation Facility & village Drainage	Assurance to non-obstruction and safety of water ways. Till now no proper drainage for runoff water.
	3. Employment	Employment Opportunity to land losers in construction work. Provision of job in railway station required for villagers.

Particulars	Issues	Suggestions by participants
	4. Provision of Roads/Hospitals/Bus stop etc.,	Provision of access road for easy transportation and communication. Road /Lights required in the area. Pucca access road required to Dhana village. Govt. Hospitals required in the area. Palwal to Kalwa bus facility is required in the area.
	5. Provision of new waterline along with earlier one	New water pipeline for remaining land. Due to the propose alignment, the water pipeline will be affected and divided in two parts.
	6. Provision of Underpass	Authority should provide Underpass
		
Consultation at Dehlaka Village Palwal	Consultation at Paroli Village /Palwal	
		
Consultation at Kalwaka Village /Palwal	Consultation at Chhaprola Village /Palwal	

Particulars	Issues	Suggestions by participants
		
Consultation at Parithala Village /Palwal		
District Nuh		

Particulars	Issues	Suggestions by participants
<p>Number of Villages: 22 Consultation held between: 29/08/2021 to 31/08/21</p> <p>Participants ProjectAffected Families – Land Owners, Non-Title Holders, PRIs & Consultant team</p>	1. Compensation	Full Land acquisition & Compensation. Require fair and transparency in compensation process through proper Government Policy. Required land for land. Compensation as per farmer assets. Villagers required compensation for tree and structure on affected land
	2. Borewells	Borewell with electric connection should be provided by government.
	3. Employment	Required job in railway for 1 member/affected family. Employment Opportunity to land losers for income restoration.
	4. Provision of Roads/Hospital/Bu s stops etc.,	Access road to every land part is required for remaining land after acquisition. Request for provision of access road to remaining land in between KMP and proposed rail alignment.
	5. Provision of waterline and Electrical lines	The proposed alignment is likely to affect waterpipeline & source along with electrical connection in these areas. So requested to taken care of the effect with layout of new water pipeline support from HRIDC & electricity connection

Particulars	Issues	Suggestions by participants
	6. Proper accessibility	For accessibility to other side of agricultural land or farm land proper access road & over bridge is required
	7. Acquisition of Alternative Land	Instead of residence area and productive land, railway should search the alternate for this.
	8. Training	Provide Agri Training to affected districts and employment opportunities to PAFs.
		
Consultation at Atta Village	Consultation at Udaka Village	
 <p>Unnamed Road, Indri, Haryana 122103, India Latitude: 28.183054° Longitude: 77.097766° LOCAL 09:25:17 GMT 03:55:17 SATURDAY 08/28/2021 ALTITUDE: 140 METER</p>	 <p>Unnamed Road, Khanpur, Haryana 122103, India Latitude: 28.196733° Longitude: 77.087659° LOCAL 10:29:32 GMT 04:59:32 SATURDAY 08/28/2021 ALTITUDE: 145 METER</p>	
Consultation at Indri Village	Consultation at Khanpur Village	
		Consultation at Bhirawati Village

Particulars	Issues	Suggestions by participants
District Gurugram		
<p>Number of Villages: 25 Consultation held between: 10/03/2021 to 8/04/2021</p> <p>Participants Project Affected Families – Land Owners, Non-Title Holders, PRIs & Consultant team</p>	<ol style="list-style-type: none"> 1. Compensation 2. Circle Rate 3. Employment 4. Provision of Roads 5. Safety of waterline/Electricity and Tube well 6. Acquisition of Remaining Land 7. Provision of Underpass 	<p>Full Land acquisition & Compensation. HRIDC does confirm about the alignment which portion of land is as per LAP will be acquired. Proper compensation is desired towards other property/structural loss.</p> <p>Minimum Land Rate should be 5 crore per acres due to increase in prices. Increase in Circle Rate</p> <p>Required job in railway for 1 member/affected family. Employment Opportunity to land losers for income restoration.</p> <p>Access road to every land part is required for remaining land after acquisition. Required service road on both side of railway line.</p> <p>The proposed alignment is likely to affect waterpipeline it will be divided in two parts. Due to railway line proposed land is divided in to two parts & electricity & tube well will also affected. Their utilities should not be affected.</p> <p>Remaining part of land should also be compensated and the ownership of remaining land should be with the owners.</p> <p>Underpass for NH-18 through KMP-(Pachgaon) will be required.</p>

Particulars	Issues	Suggestions by participants
 <p>Unnamed Road, Patli, Haryana 122506, India Latitude: 28°24'55.757"N Longitude: 78°51'30.576"E LOCAL: 13:03:11 GMT: 07:37:21 SATURDAY 04/05/2021 ALTITUDE: 174 METER</p>		
<p align="center">Consultation at Patli Village</p>	<p align="center">Consultation at Langra & Udaypuri Village</p>	
 <p>Unnamed Road, Silani, Haryana 122102, India Latitude: 28°13'29.956"N Longitude: 77°51'16.45"E LOCAL: 10:58:53 GMT: 05:29:50 MONDAY 04/05/2021 ALTITUDE: 182 METER</p>		
<p align="center">Consultation at Silani Village</p>	<p align="center">Consultation at Village Chandla Dungarwas</p>	
		
<p align="center">Consultation at Village - Fazalwas</p>		

District Jhajjar		
<p>Number of Villages: 18 Consultation held between: 14/07/2021 to 19/07/2021</p> <p>Participants: Project Affected Families – Land Owners, Non-Title Holders, PRIs & Consultant team</p>	Compensation	Require fair and transparency in compensation process through proper Government Policy. Required land for land. Compensation as per farmer assets. Villagers required compensation for tree and structure on affected land. Compensation for trees and crops should be given. They also want one-time full compensatory amount is to be released after declaration
	Fisheries	Additional compensation should be given for Fisheries
	Borewells/Wells	Borewell with electric connection should be provided by government.
	Employment	Required job in railway for 1 member/affected family. Employment Opportunity to land losers for income restoration.
	Provision of Roads/Hospital /Bus stops etc.,	Access road to every land part is required for remaining land after acquisition. Request for provision of access road to remaining land in between KMP and proposed rail alignment. Access road should not be interrupted by the HARC Track. Also requested for railway station at Devarkhana village for which land is also available.
	Provision of waterline and Electrical lines	The proposed alignment is likely to affect water pipeline & source along with electrical connection in these areas. So requested to taken care of the effect with layout of new water pipeline support from HRIDC & electricity connection
	Proper accessibility/underpass	People requested for an underpass between Ismilpur and Devarkhan
	Acquisition of Alternative Land	Instead of residence area and productive land, railway should search the alternate for this.



Unnamed Road, Badli, Haryana 124105, India
Latitude 28.572142° Longitude 76.812502°
LOCAL 12:23:22 GMT 07:53:22 THURSDAY 07/15/2021 ALTITUDE 170 METER

Consultation at Badli Village



mandhoti Bazar, Mandhoti, Haryana 124506, India
Latitude 28.708250° Longitude 76.820954°
LOCAL 10:56:54 GMT 06:26:54 SUNDAY 07/18/2021 ALTITUDE 169 METER

Consultation at Mandhoti Village



Falehpur Ismailpur Rd, Ismailpur, Haryana 124105, India
Latitude 28.507430° Longitude 76.820260°
LOCAL 12:09:44 GMT 07:09:44 THURSDAY 07/15/2021 ALTITUDE 160 METER

Consultation at Ismilpur Village



Unnamed Road, Haryana 124105, India
Latitude 28.527162° Longitude 76.850655°
LOCAL 12:00:05 GMT 06:30:05 THURSDAY 07/15/2021 ALTITUDE 0 METER

Consultation at Mundakhera Village



Consultation at Dariyapur Village

District Sonipat		
<p>Number of Villages: 18 Consultation held between: 19/07/2021 to 22/07/2021</p> <p>Participants: Project Affected Families – Land Owners, Non-Title Holders, PRIs & Consultant team</p>	<p>Compensation</p>	<p>Villagers required compensation for structure on affected land. Compensation for trees, cowshed and crops should be given. They also want one-time full compensatory amount is to be released after declaration. HRIDC should confirm which portion of land will be acquired. Need clarity on this issue at earliest.</p> <p>During the time of compensation, a government authority from the revenue department must be present for transparency. Compensation Part must be handled by Government in case of multiple owners..</p> <p>PAPs want compensation at the same rate as given by Gale India at the rate of Rs.2.90 croresper acre so they get compensation on the same terms.</p> <p>Compensation for every affected property after identification shall be done.</p> <p>Royalty on our land should be properly given.</p>
	<p>Borewells/Wells</p>	<p>Borewell with electric connection should be provided by government. Provision for restoration of affected bore wells</p>
	<p>Employment</p>	<p>Employment Opportunity to land looser for income restoration.</p> <p>Project affected farmers should be provided with such type of Plot where they can earn livelihood. Loss of income should be converted into employment opportunities.</p> <p>Other land area from Government land should be given to daily labourers, they will do farming and fair payment should be given to such farmers</p>
	<p>Provision of Roads/Hospital /Bus stops etc.,</p>	<p>Access road to every land part is required for remaining land after acquisition. Request for provision of access road to remaining land in between KMP and proposed rail alignment. Access road should not be interrupted by the HORC Track. Also requested for railway station at Devarkhana village for which land is also available.</p>

	Provision of waterline and Electrical lines	The proposed alignment is likely to affect water pipeline along with electrical connection in these areas. So requested to taken care of the effect with layout of new water pipeline support from HRIDC & electricity connection
	Provision of underpass	People requested for an underpass between Ismilpur and Devarkhana
	Acquisition of Alternative Land Training	Instead of residence area and productive land, railway should search the alternate for this. Agri Training should be provided to affected districts and employment opportunities to PAFs



Consultation at Harsana Kalan Village	Consultation at Jagdish Village
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Consultation at Chatera Village	Consultation at Narsinghpur Village
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Consultation at Nahra Village

6.7 CONSULTATIONS WITH WOMEN

In HORC project, affected District women were requested to participate, initially they were reluctant as the consultations were done during the time of COVID-19 and simultaneously it was harvesting season. Later on, OMTc team tried and were successful in conducting Consultations with women in 20 villages out of 88 villages of project affected districts.





Consultation in Malha Majra Village on 21/07/21



Consultation in Harsana Kalan Village on 22/07/21

Consultation in Jhajjar District with Women



Consultation in Dewarkhana Village on 14/07/21



Consultation in Badli Village on 15/07/21



Consultation in Durgapur Village on 15/07/21



Consultation in Ismailpur Village on 15/07/21

Consultation in Gurugram District with Women	
	
Consultation in Patli Hajipur Village on 09/03/21	Consultation in Sancholi Village on 11/03/21
	
Consultation in Udaypuri Village on 13/03/21	Consultation in Chandla Dungarwas Village on 13/03/21
	
Consultation in Silani Village on 5/04/21	

Consultation in Palwal District with Women	
	
Consultation in Dehlaka Village on 12/03/21	Consultation in Prithla Village on 3/03/21
Consultation in Nuh District with Women	
	
Consultation in Indri Village on 29/08/21	Consultation in Dhulawat Village on 30/08/21
	
Consultation in Goela Village on 28/08/21	Consultation in Khanpur Village on 29/08/21



Consultation in Udaka Village on 29/08/21

Figure 6.1: Consultation with Women Group

FGDs were conducted with women in project affected Districts the summary of consultations is given below in **Table 6.3**.

Table 6.3: Summary of Consultations with Project Affected Women

Particulars	Issues	Suggestions by participants
Consultations were carried out in 20 villages of the 5 project affected Districts Date of Consultation: 09/03/21 to 30/08/21 Participants: Project affected Women Group	Safety	Please ensure safety of Children and Elderly
	Access during construction	Construction will stop School Buses and other vehicles then how will our children go to school. It will be expensive and time consuming
	Disruption in facilities	Due to impact on municipal services and waterlines our day-to-day activities will be impacted, our task will be manifolds please arrange alternative for these
	Siting of labour camp	Construction workers should not be camped near habitations
	Safety of Cattles	Safety of our cattle while crossing the construction site
	Impact on fodder for domestic animals	Land acquisition will impact the feed stock of our domestic animals and everything will become costly. Please suggest ways to overcome these difficulties
	Impact on drainage system	Drainage of the area should not be hampered
	Impact on door to door services	We are getting vegetables on our doorstep by the vendors. During construction they will also avoid coming. There are many unforeseen problems whose solutions are to be sought out

6.8 CONSULTATION WITH VULNERABLE GROUP

The definition of Vulnerable group/ persons is that - those with challenges that make them at higher risk of falling into poverty compared to others in the projects area. Followin are the categoriories of Vulnerable Groups/ Persons: (i) PAFs falling under Below Poverty Line' (BPL) category; (ii) persons who belong to Scheduled Castes (SC) and Scheduled Tribes (ST); (iii) Female Headed Family/Household (unmarried women, separated/divorced, widow, etc); (iv) Elderly people above the age of 60 years and living alone without direct support; and (v) People with disabilities or orphan. In the Project affected Households, People with disabilities or orphan were not found and no schedule tribe household was found. The consultations were held with BPL, WHH and Elderly persons. The photographs are given in **Figure 6.2** below:

Consultation with Vulnerable Group	
	
<p>At Langra Udaipuri Village on 13/03 21, Gurugram District</p>	<p>At Jhanjrola, Village on 8/04/21in Gurugram District</p>
	
<p>At Asoda Village on 17/07/21 in Jhajjar District</p>	<p>At Mandothi Village on 18/07/21in Jhajjar District</p>



Figure 6.2: Consultation with Vulnerable Group

Issues discussed are summarized below in **Table 6.4**.

Table 6.4: Summary of Consultations with Project Affected Vulnerable Group

Particulars	Issues	Suggestions by participants
Consultation with Women Headed Household		
Consultations were carried out in 20 villages of the 5 project affected Districts Date of Consultation: 09/03/21 to 30/08/21 Participants: Project affected Vulnerable group	Livelihood	Due to acquisition of Land Livelihood will be impacted. Employment should be given to one member of family before LA
	Compensation for Cowshed	Cowsheds are impacted. Compensation should be given before the onset of winter and rainy season
	Free Training	Free Training to women farmers.
	Connectivity	Requirement of improved connectivity so that one can reach Hospital and Schools in case of emergency
	Shifting allowance	Shifting allowance and some money to be given for transition phase
	Identification of Borewell location	To reconstruct Bore wells, best location should be identified by Authorities
Consultation with BPL Household		
Consultations were carried out in 20 villages of the 5 project affected Districts Date of Consultation: 09/03/21 to 30/08/21 Participants: Project affected BPL House holds	Higher Compensation	Compensation should be higher for BPL category
	Free Training	Free training for Skill Development
	Income Restoration and Enhancement	Need help in Income restoration and Enhancement in Income
	Preference in Employment	Preference in Employment during Construction phase
	Monitory Support	Pocket money for Bad days during Transition
Consultation with 60 years and above 60 years of age (male and female both)		
	Human friendly infrastructure facilities	Being Landowners they need facilities to help in their

Particulars	Issues	Suggestions by participants
Consultations were carried out in 20 villages of the 5 project affected Districts		mobility-no pits, smooth road, short cuts and no ponding of water
Date of Consultation: 09/03/21 to 30/08/21	Continuous Water and Electric supply	For safety they need continuous electricity, water supply and no disturbance in sewer lines
Participants: Project affected Elderly Persons	No waiting for Health check-ups	Nearby health care services should not keep them waiting
	Labour related societal Issues	Laboure should not misuse their fields
		No poaching in their land
		Laboure should not misbehave with their ladies and children
	Diversion to be at grade	During construction the diversion should be at grade so that we they go by foot safely as in this age one is accident prone
	Control of Pollution of Air and noise	Control Dust and noise pollution as it triggers cough, Asthma and Headache
	No construction at night	No construction to be done at night as their sleep can easily be disturbed
	Proper illumination on roads	The roads should be properly illuminated as with age eyesight is also impaired

6.9 SUMMARY OF CONSULTATIONS

Public consultations and FGDs were carried out during baseline environment and socio-economic survey at village level. Major environmental and social issue like compensation, livelihood opportunity, shifting allowance, women empowerment, infrastructure facilities, awareness about project and benefits of the project towards employment in construction phase, environmental pollution were discussed during consultation. **Table 6.4** presents summary of the consultations.

Table 6.4: Summary of Consultations

Issues	Concerns/Views/Suggestions of the People in Project Area
Awareness about the HORC Project	Most of the people in project area were aware about the project. People heard about the project through newspaper, from person to person and from survey team. Educated people are aware through master plan of NCR.
Perception about the Project	Most of the villagers believe that development of our area will be taken place because of this HORC project. The project is beneficial for the districts through which it is passing.
Major occupation of the people	Almost 75-85% people involve in agriculture and agriculture based activities and small portion of people doing labour, and services in and around the villages.
Major crops grown by the farmers	In majority of the villages major crops grown by the farmers are Wheat, Paddy, Maize along with vegetables.
Source of Irrigation	Majority of the village have Bore well, Private Tube well.
Basic amenities facilities available in and around the village	Most of the facilities are available but due to HORC project, villagers feel that these facilities should not be disturbed and at the same time they should be strengthened.
Land Acquisition	<ol style="list-style-type: none"> 1. Land acquisition should be minimized; 2. If any land parcel is coming between HORC and KMP that should also be acquired; 3. Remaining land part should also be compensated, and the ownership of remaining land should be with the owners; 4. Land Rate should be at least 5 crs.per acre; 5. Land plot in lieu of land should be given by the Government.
Compensation for loss of land and structures (Residential, Commercial and others).	<ol style="list-style-type: none"> 1. Fair compensation must be given for every loss of farmers getting affected; 2. Compensation should be given immediately; 3. Maximum DLC rates should be given as per different village-wise; 4. Compensation process should be easy and immediate payment is required; 5. Compensation should be on equal rate; 6. In this project additional compensation should be given for fisheries, wells, house, other structures; 7. Same compensation from Kundli to Palwal should be fixed; 8. Loss structures, trees and cowsheds etc. should be paid fairly; 9. Payment of compensation should be made in the mode of cash and in market rate; 10. Well, tube wells, canals should be compensated fairly; 11. Stamp duty should be given free; 12. Royalty should be provided on the basis of KMP.
Employment of local people	<ol style="list-style-type: none"> 1. Affected farmers are asking for Jobs in the proposed project as per eligibility; 2. Employment opportunity and Job should be given to land losers;

Issues	Concerns/Views/Suggestions of the People in Project Area
	<ol style="list-style-type: none"> 3. Local people should get Government Job; 4. Locals must be provided with jobs; 5. Employment opportunities should be provided during construction of this project; 6. Equal remuneration to both man and woman.
Resettlement Assistance	Proper resettlement and rehabilitation assistance should be provided.
Provision of Road and Bridge	<ol style="list-style-type: none"> 1. Road must not be disturbed due to this project; 2. A proper road should be given to access their lands; 3. At least 33 feet road for public use should be given near rail line; 4. Underpasses should be constructed near important crossings especially near school, hospitals and government offices; 5. Foot over bridges or foot under bridge should be provided at important locations.
Pipeline for irrigation	<ol style="list-style-type: none"> 1. Pipelines used for Irrigation purpose must be in good condition or renewed if get defected due to the project; 2. Irrigation canals should be constructed permanent.
Damage of Well, Tube well, Pipelines, Bores etc	<ol style="list-style-type: none"> 1. Pipeline and underground pipes i.e. water supply; sewer pipelines should be relocated & constructed; 2. Adequate compensation for affected properties shall be provided.
Disturbance of Water flow	Water flow should not be affected and it should be ensured.
Shifting of religious and cultural properties	Shifting of religious and cultural properties should be avoided.
Provision of Stations	Station should be made in Devrkhana and Land is also available for this.
Control of Pollution	<ol style="list-style-type: none"> 1. Control Dust and noise pollution as it triggers cough, Asthma and Headache 2. No construction should be allowed at night as their sleep can easily be disturbed 3. The roads should be properly illuminated as with age eyesight is also impaired

6.10 SAFEGUARDS DOCUMENTS DISCLOSURE

In order to make the EIA, SIA and RP preparation and implementation process transparent, a series of public consultation meetings with all stakeholders will be carried out in the field for dissemination of information regarding rehabilitation process and entitlement framework. The salient features of RPF will be disclosed by HRIDC at prominent places in the project area. The documents available in public domain will include: EIA, SIA, RPF, RAP and ESIA. All documents will be kept in the offices of HRIDC. As per PPM Policy of AIIB all safeguard documents will also be available at the AIIB Portal. The HRIDC-GC Team will assist in community level disclosure and information dissemination work, which will include community display, meetings and consultations. Further, consultations will be held amongst all stakeholders. Summary of the EIA, SIA and RP translated in Hindi will be distributed to the stakeholders and their views and suggestions will be considered depending on their applicability.

STAKEHOLDER ENGAGEMENT PLAN

7.1 BACKGROUND

As a part of ESIA Study, a Stakeholder Engagement Plan (SEP) has been prepared for HORC Project to keep stakeholders informed on the project progress. This would ensure appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in timely, understandable, easily accessible and in appropriate manner through structured format. The SEP shall also to create a process that provides opportunities for stakeholders to express their views and concerns, and allows HRIDC to consider and respond to them. Stakeholders will be actively involved in decision making and project implementation processes throughout the project.

The overall objective of this SEP is to define a program for stakeholder engagement, including public information disclosure and consultation, throughout the entire project cycle. The SEP outlines the ways in which HRIDC team will communicate with stakeholders and includes a mechanism by which people can raise concerns, provide feedback, or make complaints about metro project and any activities related to the project. The involvement of the local population is essential to the success of the project in order to ensure smooth collaboration between project staff and local communities and i) minimize and mitigate environmental and social impacts/risks related to the project activities and (ii) to maximize the positive E&S impacts of the project.

Table 7.1: Stakeholders Group with Interest in HRIDC

Type of Stakeholder	Description
Government	Ministry of Urban Development, GoI Ministry of Finance, GoI Ministry of Railways, GoI Archaeological Survey of India Transport Department, GoH Development Authority of Concerned Districts Municipal Corporation of Concerned Districts Forest & wildlife Department, GoH State Pollution Control Board, Haryana State Archaeological Department, Haryana Department of Labour, GoH District Administration Land Acquisition Officer of Concerned Districts District Level Officials from Revenue Department of Concerned Districts District Police of Concerned Districts Public Works Department, GoH Technical Education Department, GoH

Type of Stakeholder	Description
	Haryana State Minor Irrigation and Tube well corporation limited Central Ground Water Authority/Board, Haryana Region Haryana State Industrial and Infrastructure Development Corporation(HSIIDC) The International Union for Conservation of Nature (IUCN)
Funding Agency	The Asian Infrastructure Investment Bank (AIIB)
Media	Hindustan Times The Times of India, The Pioneer Indian Express Hindustan Dainik Bhaskar Danilk Jagran Rashtriya Sahara Navbharat Times Amar Ujala India Today Tribune
Commuter and passengers	Employees Passengers
Community	Project Affected People Resident Welfare Associations Local Traders, Traders Association, Haryana Petroleum Traders Association Local Residences
Public & Academic Institutions	SLD Girls College of Education - Prithla World Institute of Technology WIT -Sohna Apeejay College of Engineering, Sohna - Haryana-IGNOU, NH 48, Gurugram Govt College for Girls - Manesar Singhania University, Manesar Jhankar College Gurugram Tagore Institute of Research and Technology - Jamalpur Dronachrya College of Engineering, Patudi <ul style="list-style-type: none"> ○ Rao Udmi Ram Memorial College of Education - Village Jamalpur, All India Institute of Medical Sciences -Tehsil Badli S. S. College of Education -Pelpa Road Jhajjar Govt. College, Badli BLS Institute of Technology Management - NH-10, Delhi-Rohtak Road Govt. ITI, Asaudah Todran Vidya collage Asoda Todran Govt. College for Women, Jassaur Kheri

Type of Stakeholder	Description
	Govt. College, Kharkhoda GC KharKhoda -Department of education Sds Govt. College, Rampur, Haryana Sahid Dalbir Singh Collage, Pipli, Bhagwan Mahaveer College of Engineering & Management, Jatheri Rd Mahavir Swami Institute of Technology, Jagdishpur, Mahaveer Swami College of Education, Jagdishpur, SRG College of Education, Sonipat, Ramjas College of Education, Sonipat

Stakeholder analysis, i.e., an in-depth look at each group's interest, how they will be affected, and to what degree and what influence they could have on the project. Within the broader framework of the project and activities to be undertaken, the following categories of stakeholders can be identified:

- (a) Stakeholders who will be directly and/or indirectly affected by the project
- (b) Stakeholders that have interest in project and interventions under the Haryana Orbital Rail project and have the potential to influence the project's outcomes
- (c) Disadvantaged/ vulnerable individuals or groups.

7.2 PROPOSED STAKEHOLDER ENGAGEMENT PROGRAM

This SEP is designed to establish an effective platform for productive interaction with the potentially affected parties and others with interest in the implementation outcome of the HORC Project. Meaningful stakeholder engagement throughout the project cycle will:

- Solicit feedback to inform project design, implementation, monitoring and evaluation
- Clarify project objectives, scope and manage expectations
- Assess and mitigate project environmental and social impacts and risks
- Enhance project outcomes and benefits
- Build constituencies and collaboration
- Disseminate project information/ materials
- Address project grievances

Adequate stakeholder consultations will require effective timing and advanced planning. To ensure information is readily accessible to affected stakeholders, and adequate representation and participation of the different groups in the process, the HRIDC will adopt strategies and different methods and techniques based on an assessment of stakeholder needs. Methods for stakeholder engagement are listed in **Table 7.2**.

Table 7.2: Haryana Orbital Rail Project Stakeholder Engagement Methods

S. No	Engagement Technique	Description and use	Target audience	Adaptations in case of Lockdown
1	Websites	Detailed Project Report (DPR), EIA, SIA, RAP, ESIA and SEP will be published on official websites of HRIDC and the AIIB. Overview of project, impacts and mitigation, and project updates through project leaflets, large format posters.	All stakeholders	Websites, Project Leaflets, large format posters
2	Media announcements	Advance announcements of commencement of major project activities, project Grievance Redress Mechanism, and other outreach needs of the project	Project affected stakeholders and communities	Leaflets with newspaper, Traditional media (radio, television, public address systems), Online Community Meeting with affected stakeholders and communities.
3	Information Centre and Information Boards	Advance announcement of commencement and progress for major project activities	Project affected communities	Leaflets with newspaper, Traditional media (radio, television, public address systems), FGD through local facilitators, Online community meetings
4	Community /Public meetings	These interactive platforms will be used to convey general information on the Project, detailed discussions on sub-project activity that is planned by the project, project environmental and social impacts and risks and mitigation measures and to provide regular updates on implementation progress to all stakeholders. Meeting will also enable stakeholders to express their views, demands,	Project- affected communities	Community meetings /FGDs through local facilitators, Online community meetings,

S. No	Engagement Technique	Description and use	Target audience	Adaptations in case of Lockdown
		constraints etc.		
5	Correspondence By phone/ email/ written letters	Distribute project information to government officials, organizations, agencies, NGOs, CBOs, Trusts, companies, community /Associations and Development Partners etc. and invite stakeholders to share their views, concerns, demands etc.	Government officials, NGOs, CBOs, Trusts, Community/ Associations, Development Partners etc.	Correspondence by phone/email /written letters, WhatsApp groups,
6	Printed media advertisement	This will be used to disseminate and disclose project documents intended for general readers and audience. (e.g., ESMP, ESCP)	General public	Printed media advertisement
7	Distribution of printed public materials: project information leaflets, brochures, fact sheets	This will be used to convey general information on the project and to provide regular updates on its progress to local, regional and national stakeholders.	General public	Distribution of printed public materials, project leaflets, brochures,
8	Internet/ Digital Media	Use of the official websites of implementing Ministries and Agencies to promote various information and updates on the overall project, impact assessment and impact management process, procurement, employment opportunities, as well as on project's engagement activities with the public and to invite all stakeholders to share their views, concerns, demands etc. through internet resources.	Project stakeholders and other interested parties that have Access to the internet resources.	Internet/Digital media
9	One-on-one interviews	This will be used to solicit views and opinions on project impacts and solutions.	Vulnerable individuals, NGOs, Trusts Associations, women groups,	Online Community Meetings, Conducting community meetings/ FGDs through local facilitators,

S. No	Engagement Technique	Description and use	Target audience	Adaptations in case of Lockdown
			PAPs etc.	
10	Workshops	This channel will be used to: (i) Present project information to a group of stakeholders; (ii) Allow the group of stakeholders to provide their views and opinions; (iii) Use participatory exercises to facilitate Group discussions, brainstorm issues, analyze information, and develop recommendations and strategies; and (iv) Recording of responses.	Government, NGOs, Trusts Associations, women groups, PAPs, etc.	Webinars
11	Focus group meetings	This will be used to facilitate discussion on specific issues such as gender-based violence, disability inclusion, etc. that merit collective examination with various groups of stakeholders using Focus Group Meetings.	Vulnerable, women groups	Online Community Meetings, Conducting community meetings /FGDs through local facilitators,
12	Surveys / Independent evaluations	Surveys will be used to gather beneficiary opinions and views about project interventions. Civil society could also be engaged to support citizen feedback surveys for the project.	Project beneficiaries	Telephone, Email Surveys and interviews through empowered local facilitators

7.3 PROPOSED STRATEGY FOR INFORMATION DISCLOSURE

Stakeholder engagement on the HORC Project will follow the standard project management cycle, which are: (i) Preparation and Design Phase; (ii) Implementation Phase; (iii) Monitoring Phase; and (iv) Completion and Evaluation Phase. The strategy for information disclosure is presented in **Table 7.3** below.

Table 7.3: HORC Project Strategy for Stakeholder Engagement

Project Stage	List of information to be disclosed	Method Proposed	Target Stakeholders	Topic of consultation	Responsibility	Tentative Timeline
Preparation or Design Phase	Project Appraisal Documents	Official websites	National, Regional and district stakeholders: Government ministries, agencies and departments, research organisations, NGOs, Development partners.	Project design, benefits and impact	HRIDC	March 2022
	EIA,SIA,ESIA,RAP, SEP	Official websites Regional and District level Publications	National, Regional and district stakeholders	Environmental and Social Management, Procurement, Stakeholder engagement	HRIDC	March 2022
		Workshops	Regional, District and community level	Project concept, benefits, impacts	HRIDC/GC	March-April 2022
		Community Consultation and Consultation with affected parties	Community Level stakeholders	Project concept, benefits, impacts	HRIDC/GC	March-April 2022
		Distribution of printed documents in relevant institution	National, Regional and district stakeholders and Community level	Project concept, benefits and impacts	HRIDC/GC	May 2022

Project Stage	List of information to be disclosed	Method Proposed	Target Stakeholders	Topic of consultation	Responsibility	Tentative Timeline
Implementation Phase	ESMP, Labor Management Procedure, Occupational Health and Safety Plan Emergency preparedness and response Project Monitoring and safeguard compliance report	Official websites Community Information Centres	National, Regional and district stakeholders	projects benefits, impacts (Security, GRM, gender based violence issues and mitigation	HRIDC/GC	2022-2024
Operational Phase	Quarterly and Annual performance reports Environmental and Social Audit reports Updates on project activities	Notice boards of PIU, Regional and District level offices	Regional and district stakeholders	Project performance, GRM, Security, Gender based violence education	HRIDC/GC	Regular
Completion Phase	Project Completion Report	Institutional completion reports	All Stakeholders	Project results	HRIDC/GC	2025

7.4 PROPOSED STRATEGY TO INCORPORATE THE VIEWS OF VULNERABLE GROUPS

The principle of inclusiveness will guide the stakeholder engagements, particularly with respect to vulnerable individuals and groups. In cases where vulnerable status may lead to people’s reluctance or physical incapacity to participate in large-scale community meetings, the project will hold separate small group discussions with them at an easily accessible venue. This way, the project will reach out to groups who, under normal circumstances, may be insufficiently represented at general community gatherings. Some strategies to be adopted to reach out to these groups include:

- Identify leaders of vulnerable and marginalized groups to reach-out to these groups
- Engage community leaders i.e., CBOs working with vulnerable groups
- Organize face-to-face focus group discussions with these populations

7.5 RESOURCES AND RESPONSIBILITIES FOR IMPLEMENTING PLANNED SEP ACTIVITIES

The Project Management Unit (PMU) headed by Chief Project Manager(CPM) has overall responsibility for stakeholder consultation and involvement. The overall institutional arrangement for implementation of planned SEP is presented in **Figure 7.1**.

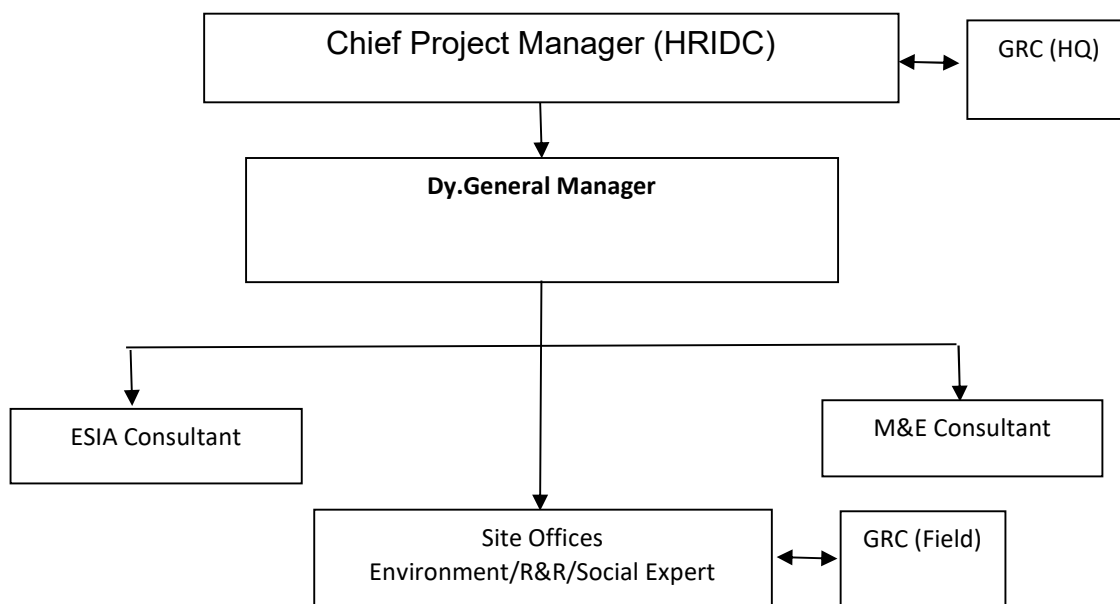


Figure 7.1: Organizational Structure of ESMU

HRIDC is responsible for implementation of the proposed Haryana Orbital Rail Corridor (HORC) project. A Project Management Unit (PMU) has been set up within the HRIDC for the execution, monitoring and co-ordination among various agencies and consultants involved in the project. The CPM, HRIDC shall be the head of the PMU. One nodal Officer of the level of Dy.General Manager(DGM) has been nominated by CPM for dealing with E&S issues. The Environment and Social Experts of GC will work under the overall

guidance of CPM, PMU and in close co-ordination with ESIA consultant, Competent Authorities, M&E consultant, and other relevant agencies or individuals involved in the project.

HRIDC has appointed a General Consultant (GC) to assist HRIDC in implementation of resettlement plan. The broad roles and responsibilities of R&R/Social Experts of GC are as under:

- Ensure documentation of census & socio-economic surveys,
- Ensure robust assessment of social impacts particularly impacts on vulnerable group,
- Ensure documentation of consultations with different groups of affected persons specifically vulnerable groups,
- Ensure timely preparation of SIA and RP and other reports and review reports before submission to AIIB for observations and clearance,
- Ensure successful implementation of RP,
- Coordinate timely transfer of land area and availability of private land area for project work,
- Make efforts to obtain no objection certificates from concerned agencies wherever applicable,
- Ensure timely public disclosure of all safeguards' documents,
- Provide guidance and necessary help to site officials in matters related to rehabilitation and resettlement activities,
- Ensure redressal of grievances by suitably coordinating with GRC members and project affected persons for timely GRC meetings,
- Ensure documentation and monitoring of all these above aspects through a detailed checklist,
- Ensure delivery of entitlements to project affected persons in transparent and timely manner,
- Ensure compliance to legal framework and AIIB's requirements,
- Prepare various reports from time to time as required covering physical and financial progress and other aspects of RP implementation,
- Undertake initiatives for capacity-building trainings of personnel involved in RP implementation on an on-going basis. PMU, HRIDC will engage external consultants on a need basis to support the capacity building efforts, if required.

7.6 Budget

Funding for the SEP implementation will be included as part of project cost and this will be financed by Government of Haryana. The project allocates an annual budget of INR 19.9 Lakh for stakeholder engagement activities in the initial phase of the project. This includes the cost of printing, documentation, advertisement, venue, transportation, refreshment and other miscellaneous. Stakeholder engagement budget will increase gradually commensurate with project development. The budget for Stakeholder engagement & Implementation is likely to increase with development of the project. Some estimated planned cost for SEP is given below in **Table 7.4**.

Table 1.4: Estimated Annual Cost for SEP

S. No	Annual Cost for SEP	Amount (in Rs.)
1	Printing	75000
2	Documentation	60000
3	Advertisement	275000

S. No	Annual Cost for SEP	Amount (in Rs.)
4	Venue (@per District Head Quarter)	80000
5	Transportation	200000
6	Refreshment	100000
7	Local Consultation at village level	700000
8	Miscellaneous (Cost for Video & Photography, Stationary, sound arrangement etc)	500000
Total (Estimated Cost)		1990000

CHAPTER - 8 GRIEVANCE REDRESS MECHANISM (GRM)

8.1 INTRODUCTION

Grievance redressal mechanism (GRM) is an integral part of the institutional arrangement in relation to environmental safeguard issues. Railway project have environmental and social impacts and therefore grievances are a fact of life. A grievance mechanism has been developed for potential use by all interested stakeholders. The aim of the grievance mechanism is to achieve mutually agreed resolution of grievances raised by stakeholders. This grievance mechanism ensures that complaints and grievances are addressed in good faith and through a transparent and impartial process, but one which is culturally acceptable. Grievances raised by stakeholders need to be managed through a transparent process, readily acceptable to all segments of affected communities and other stakeholders, at no cost and without retribution. The grievance mechanism should be appropriate to the scale of impacts and risks presented by a project and beneficial for both a proponent/operator and stakeholders, especially PAPs.

Haryana Rail Infrastructure Development Corporation Ltd. (HRIDC) will develop a Grievances Redress Cell (GRC) for Haryana Orbital Rail Corridor (HORC) project to receive and respond to the concerns, complaints, and grievances received from the stakeholders. The phone numbers and communication addresses for grievances will be displayed at various locations near construction site.

The grievances will be received by following ways:

- Letter to Grievances Redress Cell or by email.
- Telephonic grievances on the phone number linked to Grievances Redress Cell. The grievances received telephonically will be noted in the telephonic grievances register.
- Grievances communicated to the field staff of HRIDC/GC/Contractor will have to be in writing and recorded by the field staff in a register, which will be given to the Grievances Redressal Cell.

Expected grievances in project involving land acquisition and rehabilitation and resettlement are:

- Category of impact and corresponding entitlements not correct,
- Non-payment of resettlement and rehabilitation entitlements,
- Name of affected persons missing,
- Affected persons missed out/ not enumerated during the survey,
- Social category and vulnerability incorrect,
- Issues related to compensation for land acquired
- Difference in land area acquired/purchased and measured at site,
- Type and use of land acquired/purchased not considered correctly,
- Wrong measurement of structure/building affected,
- Wrong valuation of structure/building,
- Indirect impact of project activities on adjoining structure/building,
- Project execution area not suitably barricaded, inadequate safety arrangements and signage in the project area,
- Non-availability of project information board,
- Construction activities at the site, quality of works, etc.

The grievances related to environment shall include but not limited to:

- Noise pollution due to vehicular traffic, machinery etc.
- Air pollution due to construction activities
- Contamination of water bodies due to disposal of any type of waste such as solid waste from labour camps, construction and demolition waste, oil spills etc.
- Use of productive land for material transportation or storage or labor camps without necessary permissions from concerned authority
- Damage to any cultural or physical resources outside the project area
- Misbehaviors of labour with the local community
- Improper construction site management, improper storage or disposal of waste / debris material, inadequate safety practices, damage to cultural or public properties and issues between the labour force and the local community.

8.2 GRIEVANCE REDRESS COMMITTEE (GRC)

There will be Grievance Redress Committee to hear and redress the grievances, if any, of the project affected families (PAFs) and Persons (PAPs) at local (project) level as well as in the Head Quarter level in Gurugram. The Grievance Redress Mechanism (GRM) will be at two levels. The working mechanism of Tier 1 and Tier 2 shall be as follows:

(A) Tier 1 of GRC

This will be the first level of grievance redress at field level and will consist of Field staffs of HRIDC, GC, Contractor and Representative of Project Affected Persons. The Field staffs of HRIDC with support from Contractor will address the problem to the extent possible and try and resolve the complaint. The GC will ensure the successful redress of the complaint and report to the Grievance Redress Cell. GC will also monitor the implemented action in the field. The time taken at the field level to address grievances will be 14 days.

The field level GRC will consider any grievance of PAFs/PAPs, give its decision in writing within a stipulated time of 14 days, and keep record of such decisions. If the aggrieved party is not satisfied with the decision, appeal could be made to Grievance Redress Committee at Head Quarter level at Gurugram. The GRC at site level is presented in Table 7.1.

(B) Tier 2 of GRC

This will include officers from HRIDC, R&R/Social/Environment Expert (GC), elected member, representative from PAPs, SDO of concerned District/deputed officer. The time taken to redress grievances will be 2 weeks at this level. The GRC at Head Quarter level is also presented in **Table 8.1**.

Table 8.1: Grievance Redress Committee- Site and HQ level

Sl. No.	GRC at Corporate/HQ Level	Sl. No.	GRC at Site Level
i.	Dy CPM, Concerned Site Office, HRIDC – Chairperson	i.	Dy. General Manager, HRIDC-Member

ii.	DGM, Concerned Site Office, HRIDC - Member	ii.	R&R/Social Expert, GC - Member
iii.	Sub-Divisional Officer of the concerned Sub-division- Member	iii.	Environment Expert, GC - Member
iv.	Environment Expert, GC - Member	iv.	Representative of Project Affected Persons – Member
v.	R&R/Social Expert, GC - Member	v.	Contractor’s Representative
vi.	Elected representative (Gram Pradhan)– Member		
vii.	Representative of Project Affected Persons – Member		

Depending on the merit of the case, Director (P&P) shall have over-riding powers to decide and resolve the dispute in addition to the GRCs given in above Table.

8.3 PROCEDURES TO REDRESS GRIEVANCE

Grievance Redress Committee at the HQ will comprise of separate line of redress for land acquisition and resettlement matters. For land acquisition the aggrieved person will first approach the concerned SDO, followed by CPM and finally the GGM (P), HRIDC. Alternately, the concerned SDO followed by DGM and finally the Dy.CPM,HRIDC.

For resettlement related matters, for non-landowners, the affected person will first approach the concerned field staffs of HRIDC and R&R/Social Expert of GC, then Grievance Redress Committee at the HQ

PRO will be a nodal person who will transmit the letter/telephonic grievances register to the respective team/departments e.g. Social, Environment, Civil, Mechanical, Electrical etc. within HRIDC & GC. Based on the response received from the technical team, PRO will respond back to the respective stakeholders via letter/email/telephonic communication regarding the complaints. PRO will also pass on the response of concerns, complaints and grievances to the contactor and GC for implementation of the actions suggested by HRIDC on the grievances.

The PRO shall disseminate the roles and responsibilities of its members and encourage the public to approach it in case they have any concerns related to HORC project implementation.

The complainant may take recourse to the Court of law, if dissatisfied with the verdict of the GRM. PAPs are expected to approach the court of law after exhausting the remedy of GRC mechanism. The grievance redressal procedure is shown in **Figure 8.1**.

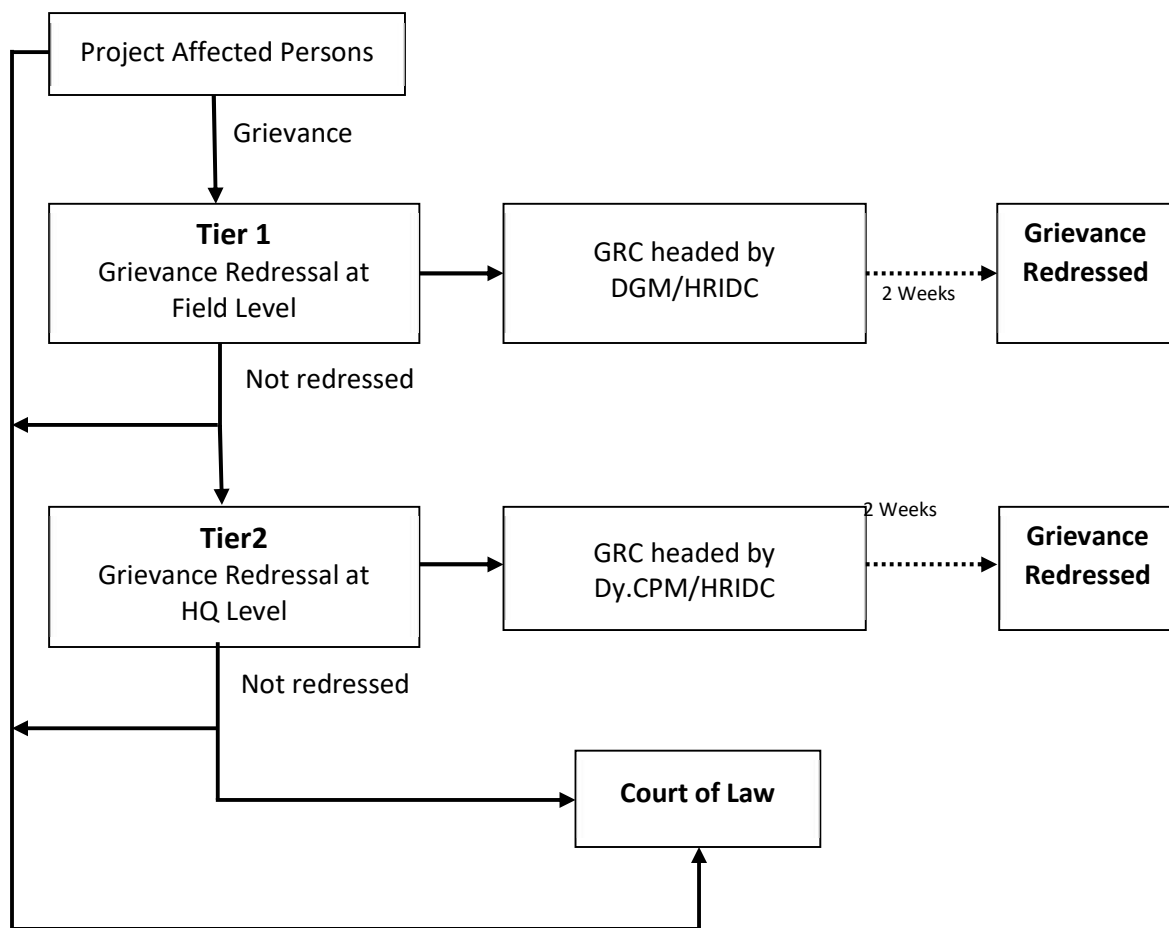


Figure 8.1: Grievance Redressal Procedure

8.4 PROJECT-AFFECTED PEOPLE’S MECHANISM (PPM)

Project-affected People’s Mechanism (PPM) has been established by the Bank to provide an opportunity for the independent and impartial review of submissions from PAP who believe they have been or are likely to be adversely affected by the Bank’s failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through the Project-level GRMs or the processes of the Bank’s Management. This Oversight Mechanism ensures that concerns or complaints received are promptly reviewed and addressed. For information on the PPM, please visit: <https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>.

8.5 MONITORING AND EVALUATION

Monitoring is an integral part of implementation of rehabilitation and resettlement activities. Internal monitoring will be carried out by the PM, Concerned Site Office of HRIDC under the guidance of Project Director. Data and information collected for monitoring activities shall be suitably analyzed for project management and learning. Key indicators (indicative) for monitoring RAP implementation are as given below:

- Disbursement of compensation and rehabilitation and resettlement assistance to PAPs,

- establishment of grievance redressal mechanism (including processes and timeline for redressal of grievances),
- Consultation meetings conducted with PAPs and communities regarding resettlement and rehabilitation issues,
- Other monitoring indicators will be considered as per the requirement.

Besides, HRIDC will engage an external monitoring consultant for preparation of quarterly monitoring reports and submitted to PMU. PMU will review the monitoring reports and then submit to AIIB for review and observations.

At the end of the project, an impact evaluation will be carried out as part of the project completion report. The evaluation will focus on assessing whether the overall objectives of the RAP have been achieved. Specifically, the evaluation will assess: (i) the level of success, timeline and constraints in land acquisition, resettlement action plan implementation, income restoration of PAPs, grievance handling mechanism (number and types of grievances/complaints, success rate of resolving of grievances/ complaints segregated by site level and Corporate/HQ level GRC, success rate of grievances/complaints resolved within stipulated time line), etc.

8.6 GRIEVANCE REDRESSAL BY CONTRACTOR

The Contractor shall constitute an appropriate Grievance Redress Mechanism (GRM) for addressing grievances at worksite. Grievances of workers will be first brought to the attention of supervisor at site. Grievances not redressed by the supervisor will be brought to the Grievance Redress Committee (GRC). The composition of GRC will have representatives from workers, women representative, ESHS staff of the Contractor ESHS staff of GC. The main responsibilities of the GRC are to : (i) provide support to workers on problems arising at worksite, (ii) record workers grievances, categories, prioritize grievances and resolve them,(iii) immediately inform the Engineer of serious cases and (iv) report to workers on development regarding their grievances and decisions of GRC. The panel of the GRC will function without any prejudice or fear of retaliation. The wellbeing of the panel members will be protected by HRIDC.

Any incidence of GBV, SEA or SH should be reported to the Grievance Redress Committee (GRC). The panel of the GRC should take appropriate gender-sensitive actions to verify authenticity of the incident with due consideration to the safety, security, and dignity of the offended person. The investigation should be concluded within three days of receiving the report or as reasonably possible. Depending on the severity of the incident, the panel may report the case to appropriate authorities.

Following the investigation, the GRC shall recommend appropriate actions to the company which may include but not limited to:

- a) Informal warning
- b) Formal warning
- c) Additional training
- d) Loss of up to one week's salary
- e) Suspension of employment (without payment of salary), for a minimum period of one month up to a maximum of six months

f) Termination of employment

Format for record of complaints is given in following Table

Records of Complaints

S. No.	Nature of Complaints	Date of Complaints Received	Impact Location	Name of Complainant	Address of Complainant	Remarks	Status		
							Solved	On going	Pending

8.7 AIIB POLICY DESCRIPTION

AIIB's ESP requires the establishment of a suitable grievance redress mechanism to receive and facilitate resolution of the concerns of people who believe they have been adversely affected by the Project's environmental and social impacts and inform Project-affected people of its availability. Be aware of and respond to stakeholders' concerns related to the Project in a timely manner. Scale the grievance mechanism to the risks and impacts of the Project. The grievance mechanism may utilize existing formal or informal grievance mechanisms, provided that they are properly designed and implemented, and deemed by the Bank to be suitable for the Project; these may be supplemented, as needed, with Project specific arrangements. Design the mechanism to address Project-affected people's concerns and complaints promptly, using an understandable and transparent process that is gender sensitive, culturally appropriate and readily accessible to all Project-affected people. Include provisions to protect complainants from retaliation and to remain anonymous, if requested. The public consultation and disclosure process will be used to disseminate information about the Project GRMs. The Project should also make reports on grievance redress and outcomes available.

The PAP's Mechanism (PPM) has been established by the Bank to provide an opportunity for the independent and impartial review of submissions from PAP who believe they have been or are likely to be adversely affected by the Bank's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through the Project-level GRMs or the processes of the Bank's Management. For information on the PPM, please visit: <https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>.

The PPM consists of a policy; directive and rules of procedure (<https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>). If grievances are not solved at site, project and state official level, stakeholder can reach at AIIBs level for their grievance resolution.

8.8 CONTACT PERSON FOR GRM

Grievance Redressal Officer

Haryana Rail Infrastructure Development Corporation Limited (HRIDC)

Plot No 143, 5th Floor, Railtel, Tower, Sector 44, Gurugram.

Email: - hridc2017@gmail.com

Phone: - +919311478889

CHAPTER – 9

RESETTLEMENT POLICY FRAMEWORK

9.1 BACKGROUND

Recognising the need to address involuntary resettlement of people and their properties, HRIDC has framed a Resettlement Policy Framework (RPF) to provide guidance dealing with adverse social impacts associated with land acquisition of proposed HORC Project and safeguard measures to avoid and mitigate the adverse impacts. It describes the policies, procedures and processes that will be followed throughout the project in the course of mitigation of adverse social impacts due to project activities among the affected persons, with and without legal title, whose land/properties, business and other assets to be acquired for the execution of the HORC Project. This chapter presents applicable laws and policies, entitlement matrix and land transfer and land acquisition process. This RPF is applicable for all subprojects implemented under HORC Project.

9.2 APPLICABLE LAWS AND POLICIES

This Resettlement Policy Framework (RPF) has been prepared conforming to the National and State laws, policies, circulars, GOs etc and the AIIB's Environmental and Social Framework (ESF), 2016. The details of laws and policies which are applicable for proposed HORC project is given in Chapter-3. However, summary of those laws and policies are presented below:

- i. The Railways Act, 1989
- ii. Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.
- iii. Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Haryana Amendment) Act, 2017.
- iv. Gazette Notification No. S.O.-3/C.A. 30/2013/S. 30/2018 dated 23rd January 2018, Revenue and Disaster Management Department, Haryana Government.
- v. Railways Circular No. E(NG)II/2010/ RC-5/1 dated 11.11.2019
- vi. Environmental and Social Framework (ESF), February 2016 and Project Affected Peoples' Mechanism (PPM) Policy of AIIB.
- vii. Other Acts and policies which may be relevant are:
 - a. Minimum Wages Act, 1948
 - b. Contract Labour Act, 1970
 - c. Child Labour (Prohibition and Regulation) Act 1996 along with Rules, 1988
 - d. Children (Pledging of Labour) Act, 1933 (as amended in 2002)
 - e. The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 and Rules 1996.
 - f. Untouchability Offences Act, 1955
 - g. The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act, 1989 and Rules 1995
 - h. Right to Information Act, 2005
 - i. Equal Remuneration Act, 1976

j. The Sexual Harassment of Women at Workplace(Prevention,Prohibition and Redressal) Act,2013

9.3 Entitlement Matrix

The entitlements of different categories of eligible persons are presented in Entitlement Matrix below indicating the type of loss, category of entitled person, applicable entitlements, etc. Eligible persons will be paid compensation and rehabilitation and resettlement assistance as per their eligibility as provided in Entitlement Matrix which has been prepared in line with RFCTLARR Act, 2013, Railways Circular No. E(NG)II/2010/RC-5/1 dated 11.11.2019 and Gazette Notification No. S.O.-3/C.A. 30/2013/S. 30/2018 dated 23rd January 2018, Revenue and Disaster Management Department, Haryana.

Entitlement Matrix

**Table-9.1: THE FIRST SCHEDULE:
Compensation for Land and Value of Assets Attached to Land or Building**

S.N.	Component of Compensation Package in respect of land acquired	Determination Procedure	Eligible Category	Explanatory Remarks
(1)	(2)	(3)	(4)	(5)
1.	Market value of land	To be determined as provided u/s 26 of RFCT-LARR, 2013 and spelled out in Note A.	a. Landowners whose names are recorded in the revenue records, or who have verifiable claims to ownership, compensation u/s 3 c (i) of RFCT-LARR, 2013	A. Compensation for Structure (a) Cash compensation for the building and assets at market value determined u/s 29 of RFCT-LARR, 2013 and Note C . In case of partial impact making unimpaired use of the structure difficult, such as where more than 25% of the structure area is affected, full compensation shall be paid u/s 94 of RFCTLARR, 2013. (b) In case of partial impact, 10% additional amount to be paid on compensation award for the affected part of the structure to enable damage repair where the owner/occupier on his/her own will be interested to retain the remaining part of the structure, provided that unimpaired continuous use of such structure is possible without hazards. (c) Right to salvage material from the affected structures without any salvage charge. (d) Three months' advance notice to vacate structures.
2.	Factor by which the market value is to be multiplied in the case of rural areas	1.00 (One) to 2.00 (Two) based on the distance of project from urban area, as notified by Gazette Notification No. S.O.-3/C.A. 30/2013/S. 30/2018 dated 23rd January 2018, Revenue and Disaster Management Department, Haryana.	b. Registered "lessees", 'tenants' or 'sharecroppers" will get an apportionment of the compensation as determined by the Appropriate Government payable under law.	
3.	Factor by which the market value is to be multiplied in the case of urban areas	1 (One)	c. In case of land occupiers (such as occupiers of abadi lands, assigned lands, or tribes occupying forest lands) with claims/	
4.	Value of assets attached to land or building	To be determined as provided u/s 29 of RFCT-LARR, 2013		

S.N.	Component of Compensation Package in respect of land acquired	Determination Procedure	Eligible Category	Explanatory Remarks
5.	Solatium	Equivalent to one hundred per cent of the market value of land mentioned against serial number 1 multiplied by the factor specified against serial number 2 for rural areas or serial number 3 for urban areas plus value of assets attached to land or building against serial number 4 under column (2).	rights recognized under state/ Central laws) covered u/s 3 c (iii), (v) of RFCT-LARR, 2013 will get compensation with solatium at par with titleholders.	<p>B. Partial impact on Land: In case only a part of any land plot is affected and its owner desires that the whole plot be acquired on the grounds that the plot has been rendered uneconomic or has been severed due to LA (u/s94 RFCT-LARR 2013 and Note B) the CALA can assess and award compensation for the remaining part of the plot; or award 10% of actual value of remaining land holding as additional compensation allowing the owner to retain the remaining land plot, if agreeable to the land loser.</p> <p>C. Compensation for trees/crops etc.</p> <p>a. Cash compensation as estimated u/s 29(3), RFCT-LARR, 2013 by:</p> <ul style="list-style-type: none"> i. Forest Department for timber trees ii. State Agriculture Extension Department for crops iii. Horticulture Department for horticulture, perennial trees iv. Cash assistance to title holders and non-title holders including informal settlers/ squatters for loss of trees, crops and perennials at market value <p>b. Three months' advance notice to affected parties to harvest fruits, crops. In case of standing crops, the affected parties shall receive three months' advance notice to salvage crops, or compensation in lieu thereof as determined above.</p> <p>D. Alternative Compensation packages. In case where a State Government through any act or Gazette Notification or as approved by any authority of State Government (duly authorized for the purpose) as per their approved procedure has fixed a rate for compensation of land, the same may be adopted by the Competent Authority in determining the compensation for land in lieu of package available under the First Schedule of the RFCT-LARR Act, 2013.</p>
6.	Final award in rural areas	Market value of land mentioned against serial number 1 multiplied by the factor specified against serial number 2 plus value of assets attached to land or building mentioned against serial number 4 under column (2) plus solatium mentioned against serial number 5 under column (2).		
7.	Final award in urban areas	Market value of land mentioned against serial number 1 multiplied by the factor specified against serial number 3 plus value of assets attached to land or building mentioned against serial number 4 under column (2) plus solatium mentioned against serial number 5 under column (2).		

S.N.	Component of Compensation Package in respect of land acquired	Determination Procedure	Eligible Category	Explanatory Remarks
8.	Other component if any to be included	Interest on compensation payable to the affected families as notified by the concerned State Government or at the rate of 12% per annum from the date of LA notification u/s 20A of The Railway Act, 1989 (amended in 2008) applicable as per Section 30 (3) of RFCT-LARR, 2013 and explained in Note A (6) .		

**Table 9.2: THE SECOND SHEDULE:
Resettlement and Rehabilitation Assistances for Project Affected People**

S.N.	Elements of Rehabilitation and Resettlement Entitlements	Eligible Category	Entitlement	Explanatory Remarks
(1)	(2)	(3)	(4)	(5)
1.	Provision of housing units in case of displacement	<p>a. All affected families defined u/s 3 C of RFCTLARR 2013 required to relocate due to the Project for which land is being acquired including land owners, customary dwellers and occupiers whose livelihood is primarily dependent on the affected.</p> <p>b. This benefits shall also be extended to any affected family which is without homestead land and which has been residing in the area continuously before the date of first land acquisition notification issued under 20 A of The Railways Act, 1989 for the HORC Project.</p>	<p>a. Rural Areas: A constructed house as per Indira Awas Yojana specifications, or Cash assistance in lieu thereof as determined by the concerned State Government under its own resettlement policy or rules, provided that such cash assistance shall not be less than Rs. 60,000.</p> <p>b. Urban Areas: A constructed house of minimum 50 sq.mts. in plinth area or cash assistance in lieu thereof as determined by the concerned State Government under its own resettlement policy or rules, provided that such cash assistance shall not be less than Rs. 1,50,000.</p>	<p>a) This cash assistance in lieu of the provision of alternative house shall be provided to all displaced families without discrimination, including resident owners, occupant land assignees, longterm lessees.</p> <p>b) This assistance shall be extendable to mixed-use structures fulfilling residential and commercial purposes in owner as well as untitled categories.</p> <p>c) Displaced squatters losing their structure will be entitled to an alternative house or cash assistance, as per a) and b) of Column 4 of Sl.No.1 of Table - 4(The Second Schedule).</p> <p>XXX</p>
2.	Land for Land	In the case of irrigation project, as far as possible and in lieu of compensation to be paid for land acquired, each affected family owning		This provision is not applicable to HRIDC rail corridor project which is linear in nature.

S.N.	Elements of Rehabilitation and Resettlement Entitlements	Eligible Category	Entitlement	Explanatory Remarks
		<p>agricultural land in the affected area and whose land has been acquired or lost, or who has, as a consequence of the acquisition or loss of land, been reduced to the status of a marginal farmer or landless, shall be allotted, in the name of each person included in the records of rights with regard to the affected family, a minimum of one acre of land in the command area of the project for which the land is acquired: Provided that in every project those persons losing land and belonging to the Scheduled Castes or the Scheduled Tribes will be provided land equivalent to land acquired or two and a one-half acres, whichever is lower (item 2, Sch. 2, RFCTLARR, 2013).</p>		
3.	Offer for Developed Land	<p>In case the land is acquired for urbanisation purposes, twenty percent of the developed land will be reserved and offered to land owning project affected families, in proportion to the area of their land acquired and at a price equal to the cost of acquisition and the cost of development: Provided that in case the land owning project affected family wishes to avail of this offer, an equivalent amount will be deducted from the land acquisition compensation package payable to it.</p> <p>(item 2, Sch. 2, RFCT-LARR, 2013).</p>		This provision is not applicable to the HRIDC rail corridor project..
4.	Choice of Annuity or Employment	Affected families defined u/s 3(c) of RFCT-LARR, 2013	<p>HRIDC shall provide Affected families with:</p> <p>(a) Employment opportunity where jobs are created through the project, after providing them suitable training and skill</p>	<p>a) Modalities for implementation of Serial No. 4 of the Second schedule of the RFCTLARR Act 2013 shall be as per Railways Circular No. E(NG)II/2010/ RC-5/1 dated 11.11.2019</p> <p>b) Suitable provisions will be made and disclosed in line with the</p>

S.N.	Elements of Rehabilitation and Resettlement Entitlements	Eligible Category	Entitlement	Explanatory Remarks
			<p>development in the required field, at a rate not lower than the minimum wages provided for in any other law for the time being in force, to at least one member per affected family in the project or arrange for a job in such other project as may be required; or</p> <p>(b) Onetime payment of 500,000 rupees per affected family; or</p> <p>(c) Annuity policies that shall pay not less than two thousand rupees per month per family for twenty years, with appropriate indexation to the Consumer Price Index for Agricultural Labourers.</p>	<p>extant Law/Rules as obtaining in the concerned State at the time of acquisition.</p> <p>c) The affected family will have the option to opt for annuity or onetime financial assistance in lieu of the above.</p>
5.	Subsistence grant for displaced families for a period of one year	Each affected family (losing residential, or/ and commercial structures) defined u/s 3 of RFCT-LARR, 2013 displaced by the Project	<p>a. Subsistence allowance of Rs. 3000 per month for one year</p> <p>b. In addition to this amount, the Scheduled Castes and the Scheduled Tribes displaced from Scheduled Areas shall receive an amount of Rs. 50,000/-</p>	<p>a. The affected family will have the option to opt for onetime payment of subsistence allowance payable over a year.</p> <p>b. The additional subsistence allowance of 50,000 rupees payable to the Scheduled Castes and the Scheduled Tribes shall be on onetime basis.</p> <p>c. The subsistence allowance will be provided to the displaced squatters, provided they are below poverty line or without an assured source of income, or if their livelihood is lost due to displacement.</p>
6.	Transportation cost for displaced families	Each displaced family in owner and non-title holder categories defined u/s 3 of RFCT-LARR, 2013	One-time financial assistance of Rs 50,000/- as transportation cost for shifting of the family, building materials, belongings and cattle.	<p>a. Transportation allowance will be provided to resident owners, lessees, protected/long term tenants, squatters</p> <p>b. All displaced families will receive three months advance notice to vacate</p>
7.	Cattle shed/small shops cost	Each affected family having cattle shed or having a petty/small shop.	<p>One-time financial assistance of such amount as the appropriate</p> <p>Government may, by notification, specify subject to a minimum of</p>	<p>a. Small shops will include commercial kiosks and shanties where business is carried out</p> <p>b. Cattle shed shall mean any permanent, semi permanent structure or makeshift shed</p>

S.N.	Elements of Rehabilitation and Resettlement Entitlements	Eligible Category	Entitlement	Explanatory Remarks
			Rs. 25,000/- for construction of cattle shed or petty/small shop as the case may be.	erected on long term basis for keeping cattle c. Affected families receiving assistance under this category (cattle shed/ 'petty/small shop) shall not be entitled to any other rehabilitation assistance under Second Schedule.
8.	One-time grant to artisan, small traders and certain others	Each affected family of an artisan, small trader or self-employed person or an affected family which owned non-agricultural land or commercial, industrial or institutional structure in the affected area, and which has been involuntarily displaced from the project affected area due to land acquisition.	One-time financial assistance of amounts, notified by the appropriate Government but not less than Rs 25,000/-.	a. The affected families eligible for this assistance may be from title holder or non-titleholder categories as defined u/s 3 (c) of RFCT-LARR, 2013. b. The actual person losing income in this category shall be eligible for this financial assistance without discrimination on the basis of gender.
9.	Fishing rights	In cases of irrigation or hydel projects, the affected families may be allowed fishing rights in the reservoirs, in such manner as may be prescribed by the appropriate Government.	-	This provision is not applicable in case of HRIDC project.
10.	One-time Resettlement Allowance	Each affected family	One time resettlement allowance of Rs 50,000/-.	a. The affected families eligible for this assistance may be from title holder or non-titleholder categories as defined u/s 3 (c) of RFCT-LARR, 2013. This will be extended also to Vulnerable households including BPL, SC, ST, WHH, Non-titleholder, disabled and elderly
10A	One-time additional allowance	Each affected family from vulnerable group	Rs 50,000/-.	This will be extended to each vulnerable family irrespective of ownership status i.e. from title holder and non-titleholder categories.
11.	Stamp duty and registration fee	Each affected family	Reimbursement of stamp duty and fees for purchase and registration of alternative property	Purchase of alternative property including land, residence, or shop to replace the lost land and assets in the name of self, or/and in the name of the spouse or joint name (self & spouse) or son/daughter within one year from the date of receipt of full compensation.

S.N.	Elements of Rehabilitation and Resettlement Entitlements	Eligible Category	Entitlement	Explanatory Remarks
12.	Provision of Resettlement Sites	Groups of affected families relocated by the Project in block in resettlement sites established for the purpose	Appropriate permanent housing with minimum specified floor area at resettlement sites with providing basic services and other provisions as spelt out in the Third Schedule of RFCTLARR, 2013 where resettlement sites are established for the displaced families	<p>a) This may not be applicable in most cases; however, wherever, such an option is planned, HRIDC shall include these in the Resettlement Action Plan (RAP) and implement the same.</p> <p>b) The RAP shall spell out services to be provided, key conditions for allowing occupancy, and indicators for withdrawal of post-resettlement support once the people are adequately settled.</p>
13.	Loss of Community Infrastructure and Common Property Resources	Affected communities and groups	Reconstruction of community structure and common property resources.	The reconstruction of community structures and replacement of common property resources shall be done in consultation with the community.
13.	Mitigation of Temporary Impacts on Lands and Assets	Affected owners of land & assets	Compensation for temporary impact during Construction like disruption of normal traffic, damage to adjacent parcel of land/ assets due to the movement of heavy machinery and plant site.	The contractor shall bear the compensation cost of any impact on structure or land due to movement of machinery during construction or establishment of construction plant. All temporary use of lands outside proposed ROW to be through written approval of the landowner and contractor. Location of construction camps by contractors in consultation with HRIDC.

Notes to Entitlement Matrix

Note A

1. Compensation would be determined by Competent Authority as per provisions in RFCTLARR 2013, Section 26, which specifies the following criterion for assessing and determining market value of the land:
 - (a) the market value, if any, specified in the Indian Stamp Act, 1899 for the registration of sale deeds or agreements to sell, as the case may be, in the area where the land is situated: or
 - (b) the average of the sale price for similar type of land situated in the nearest village or nearest vicinity, ascertained from not less than 50% of the sale deeds registered during three years.

Whichever is higher.

The date for determination of market value shall be the date on which 20A notification has been issued.

Explanation 1. – The average sale price referred to in clause (b) shall be determined taking into account the sale deeds or the agreements to sell registered for similar type of area in the near village or near vicinity area during immediately preceding three years of the year in which such acquisition of land is proposed to be made.

Explanation 2. – For determining the average sale price referred to in Explanation 1, one-half of the total number of sale deeds or the agreements to sell in which the highest sale price has been mentioned shall be taken into account.

Explanation 3. – While determining the market value under this section and the average sale price referred to in Explanation 1 or Explanation 2, any price paid as compensation for land acquired under the provisions of this Act on an earlier occasion in the district shall not be taken into consideration.

Explanation 4. – While determining the market value under this section and the average sale price referred to in Explanation 1 or Explanation 2, any price paid, which in the opinion of the Collector is not indicative of actual prevailing market value may be discounted for the purposes of calculating market value.

2. The market value calculated as per (1) above shall be multiplied by a factor as notified by Gazette Notification No. S.O.-3/C.A. 30/2013/S. 30/2018 dated 23rd January 2018, Revenue and Disaster Management Department, Haryana.
3. Where the market value as per (1) or (2) above cannot be determined for the reason that-
 - (a) the land is situated in such area where the transactions in land are restricted by or under any other law for the time being in force in that area; or
 - (b) the registered sale deeds or agreements to sell as mentioned in clause (a) of sub-section (1) for similar land are not available for the immediately preceding three years; or
 - (c) the market value has not been specified under the Indian Stamp Act, 1899 by the appropriate authority,

The State Government concerned shall specify the floor price or minimum price per unit area of the said land based on the Price calculated in the manner specified in sub-section (1) irrespective of similar types of land situated in the immediate adjoining areas:

4. In determining the amount of compensation to be awarded for land acquired under RFCTLARR Act 2013, the provision under Section 28 of the Act shall be taken into consideration.
5. Those occupying village common lands/abadi lands prior to 1961 shall be eligible to be treated as “regularized land holders” as permitted by law and shall be provided with alternative land or site allowance equivalent to land compensation
6. In addition to the market value of the land awarded, in every case the competent authority will award an amount at the rate of 12% per annum on such market value for the period commencing on and from

the publication of the notification u/s 20A till the date of award or the date of taking possession, whichever is earlier.

Note B

In case only a part of any land plot is affected and its owner desires that the whole plot be acquired, the competent authority may make additional award as per Section 94 of RFCTLARR 2013 for the remaining part of land without initiating the land acquisition process afresh.

Note C

The compensation for houses, buildings and other immovable properties will be determined on the basis of current market value by referring to relevant Basic Schedule of Rates (B.S.R) as on date without depreciation. While evaluating structure value, services of competent engineer, or any other specialist shall be arranged. While considering the B.S.R, the CALA shall use the latest B.S.R for the residential and commercial structures in the urban and rural areas of the region, and in consultation with the owners.

Note D

The compensation for non-titleholders will be as under-

1. Provision of housing units in case of displacement
2. Subsistence grant for displaced families for a period of one year
3. Transportation cost for displaced families
4. Cattle shed/small shops cost
5. One-time grant to artisan, small traders and certain others
6. One-time Resettlement Allowance

For details on entitlements Table 4: The Second Schedule: Resettlement and Rehabilitation Assistances for Project Affected People may be referred.

Note E

The proposed HORC Project passes through green field area in the five districts of Haryana. The project requires 75.7% of total land from private ownership for its related activities. Therefore, physical displacement of families in the project area is not anticipated by this project due to acquisition of land in green field area. However, in case, the project requires physical displacement of four hundred or more families, an officer shall be appointed as an Administrator and as a Commissioner for the purpose of Rehabilitation and Resettlement of affected families as per Section 200 of The Railways Act, 1989.

9.4 LAND TRANSFER & ACQUISITION

Processes to be followed for taking land for the project are provided below:

Land Ownership	Process to be followed for land taking	
HSIIDC, Indian Railways and DFCCIL	<ul style="list-style-type: none"> • As per the standard procedure followed for inter-departmental transfer. • Conduct census & socio-economic survey of PAPs, meaningful consultations & prepare SIA and RP aligned with the requirements of AIIB ESP ESS2 Involuntary Resettlement. • Disclosure of draft and final RPF, SIA, and RAP, together with the consultation documentations. • Grievance redress mechanism should be in place to receive and address any complaints, grievances or concerns. 	
Process of Private land acquisition as per the provisions of The Railways Act, 1989	Section	Brief description
	20A	Power to acquire land
	20D	Hearing of objections.
	20E	Declaration of acquisition
	20F	Determination of amount payable as compensation.
	20F(6)	Arbitration
	20G	Criterion for determination of market value of land
20I	Power to take possession	

CHAPTER - 10

ENVIRONMENT AND SOCIAL MANAGEMENT AND MONITORING PLAN

10.1 INTRODUCTION

The Environmental and Social Management Plan (ESMP) provides the measures to be undertaken during the various stages of the project to offset or mitigate the adverse environmental and social impacts to acceptable levels. The ESMP is required to be integrated in the project covering all phases of the project cycle that is planning, construction and operation management. The provision of necessary safeguards in planning of the project itself can lead to reduction of environmental and social impacts of the project to a great extent. The development of the HARC entails civil works including excavation, back filling, construction of RUBs/ROBs, bridges, cross drainage structures and utility shifting which are likely to cause adverse impacts on the natural and social environment. The impacts cannot be fully avoided; however, appropriate mitigation measures are suggested to minimize and compensate for the potential adverse impacts and enhance the positive impacts. Environmental and social management is based on the potential impacts assessed for the project. Assessment of the potential impacts is made based on the review of secondary information and substantiated by field survey and measurements, public consultation, household survey and discussions with concerned authorities. The implementation of the ESMP requires the following:

- ✓ Implementation of the mitigation measures;
- ✓ Monitoring the implementation program;
- ✓ Reporting to the designated institutions;
- ✓ Training and capacity building;
- ✓ Allocation of budget for the mitigation measures;
- ✓ Organizational structures for the implementation of the mitigation measures;
- ✓ Establishment of the ESMP.

10.2 BASIC APPROACH OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) is designed based on the impact assessment which comprehensively covers all aspects of the natural (Physical and biological) and social environment so that adverse impacts if any are taken care of and the project does not create any hazard or affect the quality of life for present and future generations in the study area. The ESMP should always have a long term perspective and make futuristic predictions considering the developmental activities likely to take place. The ESMP often provides the financial outlay for all environmental related aspects in the study area. Detailing of the budgetary provisions for different activities is useful for the project authorities.

10.2.1 Objectives of Environmental and Social Monitoring

- To assist in detecting the development of any unwanted environmental and social situation and thus, provide opportunities for adopting appropriate control measures;
- To define the responsibilities of the Project Proponents, Contractors and Environmental and Social Monitors and provides means of effectively communicating environmental and social issues among them;
- To define monitoring mechanism and identify monitoring parameters;

- To evaluate the performance and effectiveness of mitigation measures proposed in the ESMP and suggest improvements in Management Plan, if required;
- To identify training requirement at various levels.

The technical approach for the ESMP includes technical, social, economic, cultural, public health and institutional components. The components are described briefly in the following points:

- ✓ Noise and vibration management;
- ✓ Air quality management;
- ✓ Water management;
- ✓ Reclamation of borrow pits and quarry areas;
- ✓ Waste management includes even the hazardous waste;
- ✓ Health issue;
- ✓ Biodiversity aspect;
- ✓ Social aspects;
- ✓ Climate aspects;
- ✓ Good construction practices;
- ✓ Risk assessment.

10.3 ENVIRONMENTAL MANAGEMENT PLAN

Following environmental management plans are prepared to offset the negative project impacts on the environment and to enhance the project positive impact on the environment.

Pre-Construction Stage (Location and Design Phase)

- Alignment;
- Loss of water bodies;
- Design provision for safety of structures against earthquake, fire, and floods;
- Archaeological Monuments;
- Utility Diversion;
- Compensatory Afforestation.

Construction Phase

- Construction Material Management and Housekeeping;
- Casting yards and Material Stockpiling;
- Air Pollution and Dust Suppression Plan;
- Noise and Vibration Reduction Plan;
- Debris Disposal Plan;
- Borrow Area Management Plan;
- Solid and Liquid Waste Management Plan;
- Hazardous Waste Management Plan;
- Construction and Demolition Waste Management Plan;
- Soil Contamination Prevention Plan;
- Labour Camps;
- Welfare of Labour on Construction Site;
- Safety Plan for Health and Hygiene of Construction Workers;
- HIV/AIDS Prevention Plan in and Around Construction Camp;

- Conservation Plan for Peacock;
- Erosion Control Plan;
- Traffic Diversion/Management;
- Biodiversity Monitoring Plan;
- Construction Site Monitoring Plan;
- Environment Monitoring Plan.

Operation Phase

- Temporary land acquisition;
- Noise;
- Soil Erosion;
- Vibration;
- Loss of trees and Avenue Planting.

10.4 PRE-CONSTRUCTION STAGE (LOCATION AND DESIGN PHASE)

10.4.1 Alignment

Alignment has been kept at grade. Geometric design of the alignment will be such as to optimize curvature. Stations shall be shaped to minimize visual intrusion. Spatial design of station has significant impact on safety of passengers, time spent in ingress & egress from station and energy consumption in station. The alignment will be designed to minimize cutting of trees and avoid minimum private land acquisition. HRIDC will ensure that for any tender for civil work of the Project, an analysis of possible alternatives and alignment adjustments will be done in order to minimize the environmental and social impacts

10.4.2 Loss of water bodies

There is no river near the project alignment and alignment is designed to avoid maximum impact on nearby water bodies (canals and drains) in line with Water (Prevention and Control of Pollution) Act, 1974.

10.4.3 Design provision for safety of structures against earthquake, fire and floods

Considering the worst-case scenario and force factors in the probability of an earthquake, fire, and floods etc. the station design and rail network alignment are designed considering safety of structures.

10.4.4 Archaeological Monuments

No Impacts on legally protected Archaeological Monuments due to proposed alignments are identified. Also, even though no cultural heritage is found in the vicinity of the Project area, HRIDC and the contractors will apply & undertake mitigative measures if case arise that meet applicable national legislation related to Cultural Heritage

10.4.5 Utility Diversion

The proposed alignment is required to negotiate sub-surface, surface and overhead utility services. Prior to the execution of work at site, detailed investigation of all utilities will be undertaken and plans for their retention in situ with precautions or temporary/permanent diversions will be prepared and got approved by respective agencies. As such, these may affect construction and project implementation time schedule/costs,

for which necessary planning/action needs to be initiated in advance. In case of underground utility services running across the alignment, the spanning arrangement of the viaduct may be suitably adjusted.

10.4.6 Compensatory Afforestation Plan

Compensatory afforestation is one of the most important conditions stipulated by the Central Government while approving proposals for diversion of forest land for non-forest uses. As per MoEF&CC notification (F. No. 11 – 353/2016-FC dated Jan. 17, 2017), the linear or strip plantation (Road, rail and canal) is declared as protected forest and it is managed by forest department. If the forest land along the linear or strip plantation is required for purpose other than the purpose for which the land was acquired even by the same department owning the land then equivalent non forest land has to be provided by the user agency for compensatory afforestation. The compensatory afforestation shall be raised over degraded forest land twice in extent of the forest area being diverted as per Forest Conservation Act, 1980.

Regulatory Framework

The tree cutting permission for the proposed project will be obtained from the concerned DFO in whose jurisdiction the project stretch falls. The linear plantation declared as protected forest area exists along the existing track in State of Haryana. So, tree cutting detail and verification of forest land will be discussed with the concerned state forest department.

Compensatory plantation in lieu of trees to be cut from the private land and non-forest lands will be undertaken as per the statutory conditions imposed by the State Government in the vacant space of project land/degraded forest land. For trees to be cut from the declared protected forest, the compensatory afforestation shall be taken up by the State Forest Department as per the provisions of the Forest (Conservation) Act, 1980.

Elements of Schemes for Compensatory Afforestation

The scheme for compensatory afforestation should contain the following details:-

- a) Details of equivalent non-forest or degraded forest land identified for raising compensatory afforestation;
- b) Delineation of proposed area on suitable map;
- c) Agency responsible for afforestation;
- d) Details of work schedule proposed for compensatory afforestation;
- e) Cost structure of plantation, provision of funds and the mechanism to ensure that the funds will be utilized for raising afforestation;
- f) Details of proposed monitoring mechanism.

The Indian Forest Conservation Act (1980) stipulates

- If non-forest land is not available, compensatory plantations are to be established on degraded forest lands, which must be twice the forest area affected or lost; and
- If non-forest land is available, compensatory forest are to be raised over an area equivalent to the forest area affected or lost.

Diversion of Forest Land for the Proposed Project

The study area falls under five districts (Palwal, Nuh, Gurugram, Jhajjar and Sonapat) of Haryana State. The total forest land required for proposed HORC project is approximately 21.4232 ha. As per the guidelines of Forest Conservation Act, 1980, block plantation is to be taken up two times of the above ground component of forest land diversion. The compensatory afforestation will be taken up in 42.8464 ha (21.4232 x 2) of denuded or degraded forest areas. It is also proposed to have avenue plantation along the proposed alignment with fencing around the new plantation to maintain the ecological balance of the areas. The location would be selected during the joint survey of land by the Divisional Forest Officer.

Funding Mechanism for Compensatory Plantation

The MOEF&CC have constituted an authority in 2004 known as Compensatory Afforestation Fund Management and Planning Authority (CAMPA) for the purpose of management of money received from user agencies for compensatory afforestation. HRIDC is the implementing agency in this proposed project which will be required to deposit the money as estimated by the State Forest Department to the CAMPA for the compensatory plantation. CAMPA of MoEF&CC release funds to the State in predetermined installments through the State Level Management Committee as per the Annual Plan of Operations drawn by the State Forest Department. The compensatory plantation for the trees on private land and non-forest land will be taken up as part of project cost. The plantation work will be taken up by the civil contractor as part of the project work.

Compensatory Afforestation by Forest Department

The compensatory afforestation scheme would be implemented by the State Government once the final approval for the diversion of forest land is granted by the MoEF&CC, GoI. State Governments obtain funds from the CAMPA unit of MoEF&CC, GoI into their CAMPA account. All districts include their proposals for taking up compensatory afforestation in the annual plan of operations. Once the plan is approved by the Regional and State level of the CAMPA authorities, plantation is taken up. Compensatory afforestation plantation activity will be taken up by the concerned forest department on approximately 44.0616 ha in as per the norms (twice in extent of the forest area).

HRIDC would actively pursue the case of forest diversion with the forest department for early plantation in the identified areas. The species to be planted outside project area will be finalized by the Forest department based on site conditions. The areas will also be monitored by the concerned forest department and the MoEF&CC regional offices to ensure the compliance of conditions for diversion of the forest land.

Tree Cutting Details and Compensatory Plantation by HRIDC

Approximately 6499 trees will be required to be removed for the HORC corridor. The census of tree was carried out for a 50 meter or more at proposed station locations along the alignment i.e. within the RoW.

Approximately 13000 trees will be planted in compliance with the conditions of permission for felling of the trees. The total compensatory plantation of about 13000 trees shall be taken up along the RoW, suitable government land and at other project facilities. Plantation in RoW shall be taken up along the alignment immediately after physical completion of embankment construction as part of

the civil works. Plantation activity can be also taken up at the stations, yards etc. once the detailed plans for the same are finalized.

Planting Pattern for Vacant Land in HRIDC Right of Way

- If land is sufficient for compensatory plantation, plantation shall be undertaken in three rows;
- In first row, a mix of flowering trees species (flowering season should be different);
- Second row have fruit-bearing species of middle-sized and evergreen;
- Third row if feasible should be of broad-leaved evergreen species.

Methodology

Suitable soil and water conservation measures will be adopted, if required. The planting arrangement and size should be based on the optimum use of the available land and quantum of irrigation water. Local voluntary organizations, sports/youth clubs may also be encouraged for protection of such plantations through provision of incentives. Plantation shall be done after two weeks of rain starts, as the trees benefit from the seasonal rains. It is advantageous to plant trees on cloudy days for their survival and best adaptation. Spacing of tree will depend based on availability of sufficient space below and above the ground to spread its roots and branches.

Generally, block plantation, avenue plantation shall be taken up in integrated areas with fencing and soil moisture conservation work. Plantation would be undertaken by providing RCC post fencing including watch and ward for protection from biotic interference especially cattle grazing. Monoculture planting shall be avoided. Mixed culture of shade-giving, flowering and fruit-bearing species shall be preferred. The seeding shall be collected from nearest nursery for plantation. Mixed species shall be selected to conserve the soil moisture.

In case of longer spells of draught, sites with adverse natural conditions, some mortality of plants is bound to occur, requiring replacement of dead plants. Considering mortality rates varying from 10% to 30% after first year plantation to 5th year, casualty replacement should be done as actually required. The maintenance of plantation shall be done up to five years. The monitoring will be done by Department of Forest, Govt. of Haryana, and Govt. of India.

As per the orders of the Government of India vide letter No. 5-2/2010-CAMPA dated 24.06.2011, the Net Present Value (NPV) of the forest land and all other CA levies shall be deposited in State specific CAMPA accounts maintained by the Ad-hoc CAMPA in New Delhi.

Selection of tree species for compensatory plantation

Plants species to be planted in compensatory afforestation should have a large surface area of leaves which is efficient in pollutant trapping mechanism. This depends upon the physiological, morphological traits such as leaf epidermis, size, leaf orientation system, etc. Trees species having thick and fleshy leaves with flexible petioles and capacity to withstand vibration are suitable. Heavier branches and trunks of the trees also deflect or refract the sound waves. The density, height and width are critical factors in designing adequate noise screen with vegetation. Combination of trees and shrubs together appears to be the best system for combating pollution. Some trees species of economic importance suggested are given in **Table 10.1**.

Table 10.1: Selection of tree species for compensatory plantation

S. No.	Common Name	Botanical Name
1	Imli	<i>Tamarindus indica</i>
2	Neem	<i>Azadirachta indica</i>
3	Shisham	<i>Dalbergia sisoo</i>
4	Mango (Aam)	<i>Mangifera indica</i>
5	Safed siris	<i>Albizia procera</i>
6	Uloo neem	<i>Ailanthus excelsa</i>
7	Amaltas	<i>Cassia fistula</i>
8	Chattivan	<i>Alstonia scholaris</i>
9	Ber	<i>Zizyphus mauritiana</i>
10	Karanj, Papri	<i>Pongamia pinnata</i>
11	Bakain	<i>Melia azedarach</i>
12	Arjuna	<i>Terminalia arjuna</i>
13	Savukkamaram	<i>Grevillea robusta</i>
14	Aak	<i>Calotropis gigantea</i>
15	Harsinghar	<i>Nyctanthus arboriristis</i>
16	Kaner	<i>Nerium indicum</i>
17	Peepal	<i>Ficus religiosa</i>
18	Kikkar (Babool)	<i>Acacia nilotica</i>
19	Bougainvillea	<i>Bougainvillea sp.</i>

As per judgment of Hon'ble Supreme Court of India (dated 28.03.2021), the rate of Net Present Value (NPV) of forest was determined on the basis of ecological role and value of forest in which 16 major forest type have been re-grouped into 6 ecological classes. The Haryana State falls under class – III of NPV rates. The rate of NPV for the dense forest class – III is 8.03 lakhs/ha in Haryana State (NPV value for 21.4232 ha @ Rs.8.03 / ha is **172.028 lakhs**). However, the same shall be finalized by the District Forest Department of concerned district, during the stage II forest clearance process.

10.4.7 Mitigation Measures for Impact due to Power Infrastructure:

Following mitigation measure will be adopted to reduce the impacts due to power infrastructure.

- Installation of appropriate erosion control measures, such as silt fencing will be adopted during construction and will remain in place until the disturbed vegetation surrounding the fenced-in site stabilizes. Construction of permanent storm water ponds adjacent to the fenced area will be adopted to mitigate the adverse effects of storm water runoff on water quality in nearby water body;
- To control air and noise pollution, general mitigation measures that will be adopted for balance civils work will also adopted for construction of power infrastructure;
- For aesthetic impact, distribution substations will be camouflaged with fencing, or landscaping;
- A barrier of mature trees or tall soil berms between the substation and nearby residences will be adopted to partially reduce the noise impacts;
- Newer downward-focused security lighting will be used to avoid or reduce light pollution;
- Standard method to reduce EMF will be adopted;

- All general precaution and safety guidelines will be adopted.

10.5 CONSTRUCTION STAGE

10.5.1 Construction Material Management and Housekeeping

The procurement source of the construction materials will be decided by the Contractor, but it will be from the licensed supplier. Procedures for storage, handling and transport of construction material shall be prescribed in ESHS method statement approved for construction.

Housekeeping is to keep the working environment cleared of all unnecessary waste, thereby providing a first line of defense against accidents and injuries. It is the responsibility of Contractor and all site personnel. Some of the measures are listed below:

- Full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the surrounding area from excavated soil, rubbish etc, which may cause inconvenience to and endanger the public;
- All stairways, passageways and gangways shall be maintained without any blockages or obstructions. All emergency exits passageways, exits fire doors, break-glass alarm points, fire-fighting equipment, first aid stations, and other emergency stations shall be kept clean, unobstructed and in good working order;
- All surplus earth and debris shall be removed/disposed of from the working areas to officially designated dumpsites. Trucks carrying sand, earth and any pulverized materials etc. shall be covered while moving;
- Unused/surplus cables, steel items and steel scrap within the working areas shall be removed to identify locations;
- All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from workplace to identified locations;
- Empty cement bags and other packaging material shall be properly stacked and removed;
- Proper and safe stacking of material is of paramount importance at yards, stores and such locations for future use. The storage area shall be well laid out with easy access and material stored / stacked in an orderly and safe manner;
- Flammable chemicals/compressed gas cylinders shall be safely stored.

10.5.2 Casting Yards and Material Stockpiling

Sites for casting of structural concrete elements and material stockpiling will be decided before start of construction. The sites will be identified by HRIDC such that displacement of persons is not involved to the extent possible.

10.5.3 Air Pollution and Dust Suppression Plan

During the construction period, the impact on air quality will be mainly due to increase in Particulate Matter (PM) along haul roads and emission from vehicles and construction machinery. Mitigation measures which shall be adopted to reduce the air pollution are presented below:

- Contractor's transport vehicles and other equipment shall conform to emission standards fixed by Statutory Agencies of Government of India or the State Government from time to time;
- The Contractor shall carry out periodical checks and undertake remedial measures including replacement, if required, so as to operate within permissible norms;
- The contractor should promote the possibility of procuring cement through bulkers instead of conventional cement bags;
- The contractor will be responsible for maintaining properly functioning construction equipment to minimize exhaust;
- Construction equipment and vehicles will be switched off when not used for extended periods of time;
- Unnecessary idle running of construction vehicles to be prohibited;
- Effective traffic management to be undertaken to avoid significant delays in and around the project area;
- Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work;
- Regular defuming shall be done by air blowers installed in the air duct pipe in series for improving air quality inside the tunnel;
- A wash pit or a wheel washing and/or vehicle cleaning facility to be provided at the exits from work sites such as construction depots and batching plants. Sufficient staff to be made available at site to manage the generated muck/soil from site such as a supervisor, labors for wheel cleaning, brooms for wheel cleaning and concrete pad where wheels will be cleaned;
- The running of DG sets shall also lead to gaseous emissions. Emission limits set by DG set need to be adhered by the contractor for operation of the DG sets.

For outdoor areas where potential dust sources are uncontrolled, such as haul roads, stockpiles, and miscellaneous unpaved areas, dust suppression by water spraying is required. Control of dust will be a high priority during remediation activities. The primary mechanism for dust control will be the use of water trucks with a spray bar and hose(s). Proactive controls will be used to reduce the amount of dust generation during Site activities, including enforcement of low-speed limits for vehicular traffic, decontamination of trucks leaving the remediation work areas and height limits for stockpiles, if applicable. A dust control training program should be done for all site personnel. This training program will review the potential sources of dust, individual responsibilities, and actions for controlling dust as described in this plan. The training will emphasize the importance of dust control to the overall success of the remedial activities and familiarize site personnel with the air monitoring requirements and appropriate dust control procedures that must be adhered to in accordance with this plan to minimize dust generation. Following are some important dust suppression measures:

(A) Trapping

Bulk material piles will not be created other than while gathering material to load into trucks (e.g., pulling soil into a pile for the excavator to load into trucks). If any bulk material piles are left on the site overnight (e.g., due to equipment failure, transportation delays, etc.), they will be trapped as necessary to limit wind-blown dust. All trucks being utilized for transport and disposal of excavated material at the site are required to be fitted with solid, sliding or slot-top type covers with no gaps when fully deployed. Trucks shall be covered immediately after loading and are to remain covered throughout the transportation and disposal of excavated material. The cover must be installed in such a way to prevent wind from entering over the leading edge of the trailer rim.

(B) Watering

The Contractor shall conduct operations and maintain the site as to minimize the creation and dispersion of respirable dust. Clean water, shall be applied to the site as necessary to prevent dust during excavation, loading/unloading, and backfilling activities. Excavation areas and on-site roadways will be kept damp, as necessary, without creating ponding or mists that travel beyond the Site boundaries. The watering operations shall be sufficient to control fugitive dust. Water shall be applied in a manner to prevent runoff.

C) Transfer Points

At all transfer points, the following guidelines will be maintained:

- During loading of soil, it must be moist during the transfer, and the transfer shall be into an overhead truck trailer only. The material drop into the trailer must not exceed 4 feet;
- All trucks entering and leaving the Site will adhere to the posted speed limit, which shall be no more than 15 Kmph;
- All loading of impacted soil must be completed on pavement where possible.

The total cost of dust suppression plan is **Rs. 6.7 crore**. Detail of the same is given below:

S. No.	Particular	Unit	Quantity
1	Number of average active sites at any point of time considering length of an active site = 2 Km	Nos	10
2	Sprinkling frequency	per day	2
3	Capacity of tanker	litre	5000
4	Water requirement per day	litre	100000
5	Number of days sprinkling is required (considering 30 rainy days per year)	Nos	1675
6	Total water requirement during entire construction period	litre	167500000
7	Number of tankers required	Nos	33500
8	Cost of one tanker	Rs	2000
Total Cost		Rs	67000000

10.5.4 Noise and Vibration Reduction Plan**Noise Management**

Following measures will be adopted to curtail the noise levels emanating from the construction sites:

- ✓ Constructing noise barrier (temporary walls) near noise sensitive receptors;

- ✓ Rerouting truck traffic away from the residential streets, if possible;
- ✓ Site equipment to be placed away from the residential location and sensitive areas;
- ✓ All equipment shall be operating in good condition;
- ✓ All equipment's and vehicles will be fitted with appropriate noise suppression equipment to reduce noise levels as far as possible. Noise barriers will be established around the yards near residential area and sensitive receptor during the activities, such as blasting and pile driving which generates high level of noise;
- ✓ Using drilled piles or sonic or vibratory pile driver which are quieter alternatives where geological conditions permit their use;
- ✓ All site workers to be trained in noise reduction for proper use of machinery and hearing protection;
- ✓ Avoiding nighttime construction activities as sensitivity to noise increases during the night time hours in residential neighborhoods;
- ✓ Using quieted equipment such as enclosed air compressor and mufflers on all engines;
- ✓ Plantations of trees and shrubs for instance contribute little to actual noise reduction, but they do have a psychological effect in reducing the perceived nuisance of the construction noise, and they are often used to soften the visual appearance of mounds and walls.

Vibration Management

In the case of vibrations from road traffic and pile driving, very deep barriers (in excess of 10 m) were found to reduce vibration. In-ground barriers are trenches that are either left open or filled with a material (such as bentonite or concrete) that has stiffness or density significantly different from that of the surrounding soil. However, trenches may be too costly for situations involving houses. They could perhaps be justified for larger buildings with strict vibration limits, such as operating theatres of hospitals or high-tech factories with sensitive processes. An economical alternative to trenches in a residential area could be a row of lime or cement piles of diameter 0.5 m to 1 m and a depth of 15 m in the right-of-way adjacent to the road. However, the effectiveness of such pile-walls has not yet been demonstrated.

At locations where the alignment is close to heritage assets or other sensitive structures, the contractor shall prepare a monitoring scheme including building condition survey prior to construction at such locations. This scheme shall include:

- Monitoring requirements for vibrations at regular intervals throughout the construction period;
- Pre-construction structural integrity inspections of protected monuments, heritage assets or other sensitive structures;
- Information dissemination about the construction method, probable effects, quality control measures and precautions to be used.

Construction activities shall be scheduled such that demolition, earthmoving and ground-impacting operations do not occur in the same time period. Unlike noise, the total vibration produced could be significantly less when vibration sources operate separately. Construction activities shall be avoided during night hours when people are more aware of vibration.

The mitigation measure for vibration is to minimize the adverse impacts that project ground borne vibration will have on residents living nearby. Perceptible ground borne vibration is generally limited to the areas within few hundred feet of the railway system. However, following are mitigation measures suggested for curtailing both the ground borne noise and vibration levels:

- ✓ Effective maintenance programs are essential for controlling ground borne vibrations;
- ✓ Avoid vibratory rollers and packers near sensitive areas;
- ✓ Operate earth moving equipment away from the vibration sensitive areas;
- ✓ Earth moving and ground impacting operations should not occur at the same period of time;
- ✓ Avoid nighttime activities. People are more aware of vibration in their homes during the night time hours;
- ✓ Controlling noise and vibrations at the source;

A provision of **Rs. 10.00 lacs** have been earmarked for providing ear plugs / muffs and also for periodical checking of the workers.

S. No.	Particulars	Cost (in Lakhs)
1	For providing ear plugs / muffs for workers associated with construction activities	3.00
2	Periodical Check-up of The Workers	7.00
Total		10.00

10.5.5 Debris Disposal Plan

During construction large quantity of debris will be generated which shall have to be evacuated, disposed off and roller compacted or laid on mild slopes with the excavation work, to such designated areas where debris do not substantially interfere with either environment/ecology or cause turbidity impairing the quality of water in area. As the debris for disposal would be progressively received at the disposal site, it would be dozed and leveled in a manner as to gradually cover the designated area.

Criteria for Selection of Debris Dumping Site

- The dumping sites should be located at easy accessible and motorable roads and also should be away from human settlement & forest area;
- No active water bodies should be present through the dumping sites;
- The site should be in plain terrain to avoid possibility of erosion and slope instability.

Following step should be followed for management of debris and excavated earth.

STEP 1- Segregation of Waste

Segregation of waste should be done on site. Proper segregation of debris and excavated earth waste avoids mixing with bio-degradable waste and other waste. Inert materials such as excavated materials comprising soil, rubble, sand, rock, brick, Asphalt, Bituminous and concrete should be separated and broken down to size suitable for subsequent filling in low lying areas.

STEP 2- Storage

All waste should be stored within the site itself. Proper screen/barricades should be provided so that the waste does not get scattered and does not become an eyesore. Good earth shall be stored separately. The debris and poor earth may be stored together, depending on the instructions given by the regulatory authorities. Solid and semi-solid wastes shall be disposed as soon as possible. Material, which can be reused at the same site for the purpose of construction, leveling, making road/pavement etc. should also be kept in separate heaps from those, which are to be sold or landfilled.

STEP 3- Collection & Transportation of Excavated Earth and Debris

All surplus earth and debris will be removed/disposed off from the working areas by reusing in site filling, leveling and borrow area fill up. In order to avoid dust or odor impact, trucks carrying sand, earth, any pulverized materials etc. shall be covered. To ensure that there is no spillage during movement. Solid and semi-solid wastes will be transported in covered dumpers and some semi-solid wastes shall be transported in tankers.

Debris and excavated earth waste will be transported from the site by trucks or tractors to disposal sites. The movement of vehicles shall be in conformance with traffic rules and permission granted by traffic police. Attempts should be made to keep the waste segregated into different heaps as far as possible so that their further gradation and reuse is facilitated.

STEP 4- Reuse and Recycling

Excavated materials are usually inert such as soil and rock and can normally be reused onsite or in public filling areas. The excavated material may have to be temporarily stockpiled on-site for subsequent re-use. Good earth shall be, as far as possible used for backfilling of pile foundations and any other pits and leveling of casting yard, labour colonies, etc.

STEP 5- Disposal of excavated earth and debris

The surplus earth and debris shall be disposed off as instructed by the regulatory authorities. In orders to avoid dust or odour impacts, vehicles leaving a site carrying excavate should have their load covered. Vehicles should be routed as far as possible to avoid sensitive receivers in the area. Permission from relevant authorities for movement and disposal of surplus earth and debris should be taken.



Figure 10.1: Typical Debris from Project Site

The cost estimate for debris disposal plan indicating engineering, biological measures and maintenance is provided in **Table 10.2**.

Table 10.2: Cost Estimate for Debris Disposal Plan

S. No.	Particulars	Amount (in Lakhs)
A.	Engineering Measures	
1	Supplying and placing in position GI wire crate on dumping site	10.00
2	RCC wall as Toe of wire crates	7.00
4.	Cost of Steel reinforcement	5.00
B.	Biological Measures	
1	Plantation of debris disposal sites	5.00
2	Barbed wire fencing on 2m high RCC posts	5.00
3	Cost of portable pump with accessories	2.00
4	Cost of sprinkler system of irrigation	5.00
C.	Technical and machinery cost	Included in civil work
Total Cost		39.00

10.5.6 Borrow Area Management Plan

Borrow areas will be identified by contractor. The finalization of locations identified by contractor depends upon the formal agreement between landowners and contractor and its suitability from civil engineering as well as environmental consideration. Meeting the guidelines/notifications as stipulated from time to time by the Ministry of Environment Forests and Climate Change, Government of India, and local bodies, as applicable shall be the sole responsibility of the contractor. Besides this, certain precautions must be taken to restrict unauthorized borrowing by the contractor. No borrow area shall be opened without permission of the Engineer-in-Charge. In addition to the established practices, rules and regulation, Engineer -in-Charge will also consider following criteria before approving the Borrow areas.

1. The borrow area should not be located in cultivable land unless unavoidable i.e. no suitable uncultivable land in the vicinity for borrowing or private landowners are willing to allow borrowing in their fields;
2. Along the roadside, borrow pits should be located 5m away from the toe line;
3. The loss of productive and agriculture soil should be minimum;
4. The loss of vegetation is almost nil or minimum;
5. Sufficient quality of soil is available;
6. The Contractor will ensure that suitable earth is available.

After identification of borrow areas based on guidelines, contractor will take approval from Engineer-in-charge and once approved the contractor will adhere to the following recommendations for borrow area to the satisfaction of Engineer.

1. In no case the depth of borrow area should exceed 2m from the existing ground level;
2. Borrow pits slope should be maintained, no steeper than 1 Vertical: 4 Horizontal;
3. In case of cultivable land, topsoil (15cm) should be preserved and stockpiled;
4. Ridges of not less than 8m width should be left at intervals not exceeding 300m. Small drains to be cut through the ridges to facilitate drainage;
5. Water pooling to be avoided/managed so that no disease spread due to water stagnation;
6. Borrow pits should be located at least 1000m away from settlements;

7. Precautionary measures as the covering of vehicles will be taken to avoid spillage during transportation from borrow area;
8. The unpaved surfaces used for the haulage of borrow materials should be maintained properly for dust suppression;
9. Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction facility is operating at the place of deposition, to minimize dust pollution;
10. Borrow pits located near settlements will be re-developed immediately after borrowing is completed. If spoils are dumped, it will be covered with a layer of stockpiled topsoil in accordance with compliance requirements with respect MoEFCC/SPCB guidelines;
11. Redevelopment of the borrow areas to mitigate the impact will be the responsibility of the contractor. The contractor shall evolve site-specific redevelopment plans for each borrows area locations, which shall be implemented after the approval of the Engineer;
12. Borrow area near to any surface water body will be at least at 15m from the toe of the bank or high flood level, whichever is maximum;
13. During rains appropriate measures to be taken to minimize soil erosion, silt fencing to be provided as directed by Engineer-in-Charge;
14. Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such borrow area will be photographed after their post use restoration and Environment Expert of Supervision Consultant will certify the post use redevelopment.

The Contractor will keep record of photographs of various stages i.e., before using materials from the location (pre-project), for the period borrowing activities (construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.

10.5.7 Solid and Liquid Waste Management Plan

During the construction phase of the project, there will be an influx of technical staff, laborers and other service providers into the project area. The proposed project will also envisage labour camps including personnel for other utility services with their families for construction phase. Sewage and solid waste will be generated from the labour camps. It is very essential that from the planning stage, sewerage management and disposal facilities for solid & liquid waste should be conceptualized to maintain the health of the people and the environment. The main sources of wastes in case of the proposed project can be divided into following categories:

- Solid and liquid wastes from labour camps;
- Bio-medical wastes from first aid facility provide for labour;
- Solid/Liquid waste from the construction or machinery sites.

The solid and liquid wastes generated are considered temporary during the construction phase of the project with requiring management for generated waste.

Any solid and liquid waste generated in the labour camps, shall be managed, and handled with due diligence and care. The wastewater (domestic waste) generated for labour camps during construction phase will be discharged through soak pit/ septic tanks. Apart from the solid and liquid waste in labour camps of project area, a lot of waste is expected to be generated on account of construction activities mainly consisting of cement bags, iron scrap, packing material, etc. It is expected that most of the iron scrap and packing material

would be recycled since it has reuse value apart from monetary values and hence, it is proposed that stipulations should be imposed on suppliers and contractors to take away the scrap and packing materials. Apart from above, substantial cement will be required for constructional works. Since cement is supplied in 50 Kg plastic bags, many plastic bags would require proper disposal through annual public auction with a provision of monthly removal of such bags from stores. Iron scraps have a resale value and, therefore, these shall be auctioned to steel re-rollers. The overall cost estimate for the management plan works out to be about **Rs. 12.0 lakhs** for the following activities.

S. No.	Particulars	Amount (in Lakhs)
1	Community toilet	5.00
2	Community dust bin	2.00
3	Waste collection handcarts including one time replacement	1.00
4	Maintenance of Trucks	2.00
5	Door step plastic dustbin	2.00
Total		12.00

10.5.8 Hazardous Waste Management Plan

It shall be the responsibility of the contractor to ensure that hazardous wastes are labeled, recorded, stored in impermeable containment and for periods not exceeding mandated periods and, in a manner, suitable for handling storage and transport. The contractor shall maintain a record of sale, transfer, storage of such waste and make these records available for inspection. The contractor shall approach only Authorized Recyclers for treatment and disposal of Hazardous Waste, under intimation to the Project Authority. The treatment and disposal sites will be identified by HRIDC in consultation with local bodies such that pollution of water bodies does not take, green areas are not impacted, and displacement of persons is not involved.

10.5.9 Construction and Demolition Waste Management Plan

Construction and Demolition (C&D) waste is part of solid waste that results from land clearing, excavation, construction, demolition, remodeling and repair of structures, roads and utilities. C&D waste has the potential to save natural resources (stone, river sand, soil etc.) and energy, reduce transportation over long distances for dumping, and reduce space occupied at landfill sites. C&D waste generated from construction has potential use after processing, grading solid waste and recycling. Following guidelines will be adopted for C&D waste:

- Segregation and temporary storage of reusable and recyclable materials at identified locations;
- Sale of metal scrap and other saleable waste;
- Identification of intended transport means and route;
- Obtaining permissions, where required, for treatment of the hazardous component and its disposal;
- Concrete material shall be broken into coarse size and reutilized in filling;
- The treatment and disposal sites will be identified by HRIDC in consultation with local bodies such that pollution of water bodies does not take place, green areas are not impacted and displacement of persons is not involved. Before dumping, recyclable material will be removed. The disposal sites will be cleaned and then treated so that leached water does not contaminate the ground water.

10.5.10 Soil Contamination Prevention Plan

Following measures will be taken during construction for prevention of soil contamination:

- Construction vehicles will be operated within the Right of Way avoiding damage to soil and vegetation;
- Diversions, access road used will be redeveloped to the satisfaction of the owner/villagers;
- Measures will be taken to prevent ingress of toxic/heavy metals. Suitable storage area for such materials will be prepared and equipment shall be made available for handling of these materials;
- All necessary precautions shall be taken such that diesel, grease, waste oil, chemicals etc. does not spill on ground;
- Regular monitoring of groundwater and soil leachate will be undertaken at muck disposal areas where possibility of ground water contamination is anticipated.

10.5.11 Labour Camps

The Contractor during the progress of work will provide, erect and maintain necessary (temporary) living accommodation for construction workers at locations away from construction sites. Following facilities shall be maintained at labour camps:

Water Supply, Wastewater and Sewage Treatment: Uncontaminated water for drinking, cooking and washing, health care, latrines and urinals, system for conveyance, treatment and disposal of sewage; adequate and clean washing and bathing places shall be provided. Wastewater shall be treated with septic tanks.

Solid Waste Management: Municipal solid waste generated shall be collected and transported to local municipal bins for onward disposal to disposal site by municipality. Solid waste management facilities shall be arranged by the construction contractors.

Health care awareness and clinics: Construction workers are more prone to infectious diseases such as HIV/AIDS. It should be prevented by following actions: Counselling, community events, clinic, and coordination with local health authorities.

10.5.12 Welfare of Labour on Construction Site

Shelter at Workplace: At every workplace, shelter shall be provided free of cost, separately for use of men and women labourers. The height of shelter shall not be less than 3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 0.5m² per head.

Canteen Facilities: A cooked food canteen on a moderate scale shall be provided for the benefit of workers wherever it is considered necessary. The contractor shall conform generally to sanitary requirements of local medical, health and municipal authorities and always adopt such precautions as may be necessary to prevent soil pollution of the site.

First aid facilities: At every workplace, a readily available first-aid unit including an adequate supply of sterilized dressing materials and appliances shall be provided. Suitable transport shall be provided to facilitate taking injured and ill persons to the nearest hospital.

Day Crèche Facilities: At every construction site, provision of a day crèche shall be made to enable women workers to leave behind their children. At construction sites where 20 or more women are ordinarily employed, there shall be provided at least one temporary structure with sufficient openings for light and ventilation for use of children under the age of 6 years belonging to such women. There shall be adequate provision of sweepers and maid servants to keep the places clean. These facilities are applicable only if woman workers are employed.

10.5.13 Safety Plan for Health & Hygiene of Construction Workers

From the information collected, it has been revealed that no ethnic disease is associated with people of the region but acute dysentery, gastrointestinal problems, acute respiratory infection are common endemic diseases prevalent in the area. The lung diseases, diarrhea, bacillary dysentery and respiratory diseases are common diseases prevalent in the area. Acute bacterial and viral respiratory infections are affecting large number of the people in this zone, which requires advanced medical treatments to reduce the number of incidences. The prevalent diseases observed by the health centers among the local inhabitants of the area are acute respiratory infection, fever, scabies, worm disease, ENT, skin diseases, common cold, diarrhea, leucoria, back pain, accidental cases and eye infection etc. The nearby (10 km radius) government run medical facilities available in the respective district are Civil Hospital (*i.e.* Gurugram, Palwal, Nuh, Jhajjar and Sonipat). The list of nearby hospitals is given in **Table 10.3**.

Table 10.3: List of Hospitals in 10km Buffer Zone

S. No.	Name of Hospitals	Distance (KM)	Side of Alignment
1	Sri Sathya Sai Sanjeevani International Centre for Child Heart Care & Research (Baghola)	5.57	Left
2	C.H.C Dudhola Govt. hospital	3.08	Left
3	Civil Hospital- Baluda Rd Rajoria Nagar-Sohna	6.27	Right
4	Anand Hospital (Tauru)	3.33	Left
5	Civil Hospital- Tauru	4.11	Left
6	ESIC Hospital (IMT Manesar Sector 3)	3.63	Right
7	Government Hospital- Sohna, Gurugram	3.58	Right
8	SGT Medical College Hospital & Research Institute, Gurugram	4.70	Right
10	AIIMS, Tehsil- Badli, Jhajjar	2.85	Right
11	Bhagwan Mahaveer Institute of Medical Science	0.29	Left
12	Ramam Hospital , Bahalgarh, Sonipat	5.26	Left
13	FIMS Hospital, Sonipat Bahalgarh Road	4.04	Left
14	Ujala Cygnus J. K. Hindu Hospital (Old Rohtak Rd near Hindu College of Engineering Industrial Area)	4.45	Left
15	Janta Charitable H	5.3	Left
16	Memorial Hospital (Mama Bhanja Chowk Anand Nagar)	5.64	Left
17	Haryana Multispecialty Hospital	5.17	Left
18	Tulip Hospital	5.16	Left
19	Civil Hospital (Delhi Road, Near Maharana Pratap Chowk)	4.98	Left
20	Para Medical Sciences & Research Council	5.69	Left

10.5.14 Human Health and Hygiene Management During Construction

1. Vehicle exhaust and dust emission may cause respiratory problems like asthma for which mitigating measures like wet excavation of exposed surfaces, shall be adopted. Frequent water sprinkling at least twice a day shall be carried out on haul roads in the project activity area. All approach roads to site shall be metalled;
2. Localized stagnation in borrow pit areas is expected during construction, which may require sprinkling of anti-bacterial/insecticides to control propagation of bacteria related disease;
3. The influx of labour force during construction warrants proper sanitation and hygiene facilities to avoid diseases related to sewage pollutants such as Typhoid, Cholera & Gastroenteritis.

Following mitigation measures are proposed to be adopted for management of health environment:

- **Awareness Program:** The project authorities should undertake through Civil Hospital, various awareness programs by organizing camps and poster presentation etc. in the directly affected areas to bring about awareness on prevention and control of various diseases such as Malaria, Dengue, Cholera, Gastroenteritis, STD, AIDS and Cancer etc. Special awareness programs should be undertaken to explain to people about diseases like Tuberculosis (TB) and Asthma.
- **Routine Checkup:** Health checkup before construction and during construction should be carried out for all the workers and distribution of health drugs;
- Provision for clean and safe drinking water to all the workers;
- Provision of adequate sanitization facility at work site;

The expenditure likely to be incurred on the implementation of the Health, Hygiene and Safety plan is **Rs. 25.00 lakhs** for following activities.

S. No.	Particulars	Cost (in Lakhs)
1	Spraying of Insecticide	3.00
2	Health Awareness / Vaccination Camps	6.00
3	Financial aid for purchasing medical equipment/ instruments etc. for Community Health Camp in project area	13.00
4	Monitoring of incidences of water related disease	3.00
Total		25.00

10.5.15 HIV/AIDS Prevention Plan in and Around Construction Camp

In construction projects social norms may become loose and workers and employees may be tempted to engage in high-risk behaviors. A large influx of males into a rural area for a construction project increases the demand for sex, especially if they are far from home and lonely.

10.5.15.1 HIV Prevention Programs for Workers

Contractor will be responsible for implementing the programs for the prevention and control of the HIV epidemic with the following in project area:

- Condom availability and use;
- HIV education and approach to sex education;
- Preventing mother-to-child transmission;
- HIV counseling camp with the help of HIV counselor of the affected districts;
- Harm reduction;
- Pre-exposure prophylaxis.

A total of **Rs 50.00 lakhs** are to incur for HIV prevention plan for the following:-

S. No.	Particulars	Cost (in lakhs)
1	Distribution/Availability of condom	5.00
2	HIV Counselor session every month	36.00
3	Conducting HIV awareness campaign	4.00
4	Distribution of HIV awareness pamphlet/booklets	5.00
Total		50.00

10.5.16 Conservation Plan For Peafowl

As per list of **The Indian Wildlife (Protection) Act, 1972**, Fauna coming under the Schedule - I is treated as endangered species. The Schedule - I fauna as per baseline survey is only Indian Peafowl or Blue Peafowl (*Pavo cristatus*). Although this is very common species and found in every locality, even in villages, certain steps should be taken to conserve the critical wildlife.

The Indian Peafowl or Blue Peafowl (*Pavo cristatus*) is a large and brightly coloured bird of the pheasant family native to South Asia, but introduced and semi-feral in many other parts of the world. The species was first named and described by Linnaeus in 1758. The male peacock is predominantly blue with a fan-like crest of spatula-tipped wire-like feathers and is best known for the long train made up of elongated upper-tail covert feathers which bear colorful eyespots. The Indian peafowl is found mainly on the ground in open forest or on land under cultivation where they forage for berries, grains but will also prey on snakes, lizards, and small rodents.

10.5.16.1 Conservation Status

The Indian peafowl is listed as of Least Concern species in the Red List of International Union for Conservation of Nature (Bird Life International 2008). This bird recognized under Schedule- I (Section-III) species of Indian Wild Life Protection Act, 1972.

10.5.16.2 Threats

- The Indian peafowl is under threat from various quarters that include the demand for feathers and wild meat, conflict with farmers during cropping season, increased use of chemical fertilizers and pesticides, and habitat degradation;
- Habitat degradation and loss—more significantly from conversion of their habitat to agriculture, habitation and industrial growth, poisoning to counter crop damage, consumption of eggs and fat extracts for alleged medicinal values, and killing for wild meat;
- Although these threats are believed to be causing an alarming decline in population, the magnitude and pattern of the effects in project study area are yet to be quantified.

10.5.16.3 Objectives of a Conservation Plan

- To improve the habitat of wildlife by reducing biotic interference caused in the form of illicit felling, poaching, grazing, shifting cultivation, encroachment, over exploitation of timber and bamboos and forest fire etc.;
- Food, water, cover and space are the most important components of wildlife habitats;
- To conserve and preserve the diversity and integrity of flora and fauna within natural ecosystem;
- To carry out extensive as well as intensive research concerning to the improvement and development of wild habitat and wildlife;
- To educate the local inhabitants about the importance of wild fauna in the forest ecosystem;
- To conserve the existing prime wildlife habitats like the areas which are frequently visited by wild animals and birds for shelter, food, water, cover, etc. By providing adequate protection and by taking various developmental measures.

10.5.16.4 Action plan for Conservation of peafowl

- Mapping of habitat and distribution status of the species across the 10 km radius from project site;
- Time series analysis of habitat change to quantify the rate of change and identify high risk areas and potential sites for further affirmative action;
- Estimation population size by established count method such as line transect, call counts and roost counts;
- Intensive ecological investigation in representative sites in major biogeography zone with focus on the effects of threats in relation to breeding success and survival probability;
- Quantification of trade, with details on source and people involved.

10.5.16.5 Conservation Measures

- Encourage afforestation activities around close to peafowl habitation. The selection of plant species should be based on requirements of peafowl roosting, food, shelter;
- Organized seminar, conferences, poster presentation at school and Gram Panchayat level around peafowl habituation area with discussed on aware local people about not kill this bird for meat, feathers;
- Small water tank should be constructed in habitation zone of Peafowl and its water quality should be maintained;
- Fruit and shade plant should be planted nearby peafowl habitation like Mango, Amla, Guava, Tamarind, Banyan, Neem, Pipal etc.;
- Small sacred grove should be constructed on wasteland in each peafowl habitation area. Sacred grove is small patches of vegetation that is protected by traditional manner. This sacred grove should be constructed on boundary about 7-10 ft height and one temple should construct in sacred grove. One person should be monitor to wild dog, monkey and give organic farming food like maize, Pulis, wheat, rice for Peafowl;
- Encourage local farmer to use bio-pesticide, bio-fertilizer and vermi-composting in agriculture practices.

The total budget for peafowl conservation purpose is **Rs. 21.00 Lakhs** as per Table given below:

S. No.	Component	Provision (in Lakhs)
1.	Habitat improvement & Mitigative (Food, water, shelter, movement, etc). ➤ Construction of some small sacred groove in different habitation area with planting of plants like bargad, pipal, gular, and shady trees in each sacred groove in villages	12.00
2.	Awareness & Extension (Forest staff will also be invited for various activities to ensure participation)	3.00
3.	Support to forest department for monitoring, rescue & Rehabilitation of wildlife (veterinary care animal health, rescue, tools and equipment's, etc.) a. Purchasing of rescue equipment's for rescue of strayed and injured wild animals and their Trans location.	3.00
4.	Administrative cost for processing inspection etc.	3.00
Total		21.00 lakhs

10.5.17 Erosion Control Plan

Main reason of soil erosion is rains/monsoon. Contractor should plan the activities so that NO bare/ loose earth surface is left out before the onset of monsoon. For minimizing the soil erosion, following preventive measures to be taken such as:

- Embankment slopes to be covered, soon after completion;
- Next layer/activity to be planned, soon after completion of, clearing and grubbing, laying of embankment layer, sub grade layer, sub-base layer, scarification etc.;
- Topsoil from borrow area, debris disposal sites; borrow area, construction site to be protected/covered for soil erosion;
- Debris due to excavation of foundation, dismantling of existing cross drainage structure shall be removed from the water course immediately;
- Diversions for bridges shall be removed from the water course before the onset of monsoon;
- Disturbed areas shall be re-vegetated or mulched permanently or temporarily. If temporary cover is to remain in place beyond one growing season, two-thirds of the seed mix shall be composed of perennial grasses.

10.5.18 Water Pollution Prevention Plan

During construction following measures will be adopted to prevent water pollution:

- Temporary drainage works shall be maintained at construction depots and batching plants;
- Construction of drainage system shall be done before commencement of the works to drain off all surface water at the site into suitable drains;
- Provision of sedimentation tanks to trap silt-laden water before discharge into the outlet drain;
- Covering with tarpaulin, the temporary excavated materials meant for backfilling on site during rainy season or at any time of the year when rainstorms are likely;
- Preventing soil particles and debris from entering the wells or water discharge points by use of filters and sedimentation basins as required;

- Ensuring that all existing stream courses and drains within and adjacent to the site are kept safe and free from any debris and any excavated materials arising from the works;
- Discharging wastewater arising from site offices, canteens or toilet facilities constructed into sewers after obtaining prior notice of no objection of agency controlling the system;
- Provision of oil separator/interceptors at Batching Plant and Construction Depot location for vehicle maintenance;
- Earth, bentonite, chemicals and concrete agitator washings etc. not to be deposited/drained in the watercourses but to be suitably treated and effluents and residue disposed off in a manner approved by local Regulatory Authorities;
- Minimize construction works in rainy season;
- Covering of temporarily exposed slope surfaces by tarpaulin in rainy season;
- Protection of temporary access roads by crushed stone or gravel in rainy season;
- Recycling of wastewater from washing down of mixer trucks and drum mixers, concrete batching & precast concrete Casting;
- Segregation of surface run-off from the concrete batching plant and casting yard area as much as possible and diversion of it to the storm water drainage system;
- Treating surface run-off contaminated by materials in concrete batching plant or casting yard within the discharge norms before disposal into storm water drains;
- Prior approval from appropriate authority for installing bore wells for water supply at site;

10.5.19 Traffic Diversion/Management

In order to retain satisfactory levels of traffic flow during the construction period; traffic management and engineering measures need to be taken. They can be road widening, traffic segregation, one-way movements, traffic diversions, acquisition of service lanes, etc. along with following:

- All construction workers will be provided with high visibility jackets;
- Road users will be warned clearly and sufficiently in advance;
- Provide safe and clearly marked lanes, buffer and work zones for guiding road users.

Various construction technologies can be employed to ensure that traffic impedance is minimized. Capital and operating cost are included in engineering cost and therefore is not included in EMP.

10.5.20 Biodiversity Management Plan (BMP)

Biodiversity is part of our daily lives and livelihood, and constitutes resources upon which families, communities, nations and future generations depend. Every organism and its variation are unique and have its own role to play in a particular ecological niche. During the last few decades, the problems of species extinction have increased dramatically as a result of human activities. Ecosystems are being fragmented and several species are in decline. The fragmentation, degradation, and loss of habitats pose serious threat to biological diversity. These losses are irreversible and pose a threat to our own well-being, considering our dependence on food crop and medicines and other biological as well as ecological resources.

The biodiversity management refers to the management of a natural resource so that it can be sustained for long time. The natural resources are the goods and services supplied by our environment and can be made useful to humans to meet their needs and wants. Natural conservation involves proper management of natural wealth, places that sustain these resources besides the human pressure that affect the resources. The

need for conservation, preservation and management of biological diversity arises on account of threats to natural terrestrial and aquatic ecosystems by anthropogenic activities.

Objective of BMP

A Biodiversity Management Plan (BMP) is a practical site-specific document developed and used by the site management team to maintain or improve biodiversity values during post construction and to determine risks. The implementation of BMP will be in consultation with state forest department. The main objectives of BMP are:

- Sustainable use of natural resources which involves scientific management of natural wealth vis-à-vis developmental activities is likely to affect the resources;
- To set out actions needed on an on-going basis to preserve/increase nature/ biodiversity value and ecosystem services during and after the completion of the project activities;
- Set targets and related actions to maintain or improve biodiversity values;
- Maximize opportunities for enhancing biodiversity and ecosystems services as a contribution towards the remediation of significant global, regional and local biodiversity losses, if any.

The process for developing a BMP is focus on identifying, evaluating, conserving (and if possible enhancing) the relevant aspects of biodiversity, and serve to avoid or mitigate biodiversity loss, with the objective of maintaining the diversity of species, habitats and ecosystems and the integrity of ecological functions

Loss of vegetation, felling of trees which have effects on nesting birds are major impact due to proposed HARC project construction activities. Necessary measures should be applied by HRIDC through state Forest Department for the effective management of biodiversity along the alignment which covers identified impacts upon biodiversity.

The threats to natural and man-made, terrestrial and aquatic ecosystems generally arise due to anthropogenic activities that may arise as a result of construction and associated activities. Therefore, biodiversity conservation and monitoring plan will be implemented to strengthen the ecosystems in and around the said project area.

10.5.20.1 Status of Biodiversity in the Study Area

As per survey conducted, a total of 71 species under 61 genera that belong to 36 families of angiospermic plant group from the core and buffer zone were recorded. Out of the total 71 plant species, 65 species under 55 genera and 33 families of dicotyledons showed the dominant vegetation of the study area whereas monocotyledon represented by only 6 species under 6 genera and 3 families. Out of these 71 species, 35 trees, 12 shrubs, 17 herbs, 5 grasses and 4 are climbers. The Fabaceae (9 species) and Momosaceae (7 species) are dominant families and Acacia is dominant genus of the study area.

List of Mammals spotted and recorded during the survey in the study area are mostly in Schedule –IV followed by Schedule V, III & II. Among the mammals Common Indian krait, House Rat, Palm Squirrel etc. are mostly abundant. Out of 14 listed mammals only Mongoose falls under Schedule-II and under Schedule-V, IV & III. As many as 2 species of mammals belonging to 2 families were recorded from the study area. All the 2 species falls under the Schedule IV category of Indian wild life protection act 1972 and falls under least category of IUCN redlist 2010. Among the mammals Common Indian krait, House Rat, Palm Squirrel etc. are mostly abundant.

A total of 19 species were recorded from the different sites of study area. All the species falls under Schedule IV of Indian Wildlife Protection Act 1972 and none were listed as globally threatened under IUCN redlist 2010.

10.5.20.2 Conservation and Preservation Areas

There are no conservation/ preservation areas in the form of any biosphere reserve, wildlife sanctuary in the vicinity of the proposed project except Sultanpur National Park which is about 2.3 km from the HORC alignment. Hence the project therefore, does not pose any threat to ecosystem or species of conservational significance except Pew fowl (peacock) which is schedule –I species as per IWPA Act, 1972.

10.5.20.3 Action for BMP

The actions for biodiversity management for the proposed project are strategies viz. preventive measures for animal mortality in operational phase, enhancement of habitats and biodiversity awareness. Some important actions are as follows:

(A) Identification of Invasive Species and Recovery of Susceptible Species

Out of a total of 71 plant species recorded from the study area, 5 species are considered as invasive alien plant species. Most of them are from Tropical America Nativity. The *Parthenium hysterophorus* was dominantly observed in the project survey area. This trend may prove to be adverse for the native plant diversity leading to decline in number of regional flora in future. In order to understand this problem and manage it the following measures are suggested in consultation with state forest department:

- Identify the areas where biological invasions have occurred and are threatening. Identify the exotic invasive species that are invading these habitats;
- Identify the institutions/experts who can undertake exhaustive incentivization to suggest management measures to minimize the negative impact of the invasive species;
- Inventories of the native species which are threatened by invasions and that require rehabilitation and management need to be prepared.

Further studies may be carried out on control of weed including bio-control measures, removal of exotic invasive plant species and obnoxious weeds.

Regarding the importance of wildlife and forests, a comprehensive awareness programme shall be arranged and run in the area including Forest Department, representative of project authorities, local representatives and local educated scholars. The awareness programme shall be carried out by direct contact, posters, organizing seminars, distribution of CDs related to the wildlife conservation etc. This programme may be implemented with the help of State Forest Department. Total budget for these activities is suggested to be

Rs. 10.00 lakhs.

(B) Habitat Improvement Programme

Habitat improvement is an integral part of any biodiversity monitoring programme. This programme consists of bringing into useful association of those conditions needed by a species for sustainability. Habitat can be improved to follow all re-vegetation techniques. Forests are vital for the survival, foraging, breeding and nesting of avifauna. Natural forests provide a variety of food materials to the birds not only in the form of nectar of flowers, fruits, seeds etc. in the trees, shrubs, herbs and grasses but they also contain a large number of insects eaten by birds. In the forests, food is always available for the faunal component. Although most floral species flower during spring through summer but fruit maturation and seed ripening

takes place in them throughout the year. Therefore, the first strategy of improvement of habitat for birds is avoiding nest predation or brood parasitism through maintenance of large contiguous forest tract.

Therefore, the fruit bearing plants of local species shall be planted under the afforestation program. These plants not only serve food for many avifauna species forage on fruit and seeds but also prove nesting place for number of species.

(C) Minimise Pollution Impacts

Minimise and eliminate activities leading to loss of biodiversity due to sources of pollution. Promote biodegradable recyclable substitute for non biodegradable material.

(D) Streghthening implementation of policy, legislation and administrative measure for Biodiversity management.

The cost of this programme (**Biodiversity Management Plan**) is suggested to be **Rs. 10.00 lakhs**.

10.5.21 Construction Site Monitoring Plan

Regular construction site monitoring shall be conducted to identify ongoing environmental issues for planning and executing mitigation measures. The following format should be used for the construction site monitoring.

Report No.:		Inspection Date		Inspected by :	
Inspection Area:					
Participants:					
S. No.	Item	Observation	Remarks	Action	
1.0	AIR POLLUTION BY Date BY Whom				
1.1	Dust (approach Roads, adjacent Roads, working area Cement handling etc.)	Site satisfactory Site dusty Sprinkling carried out as required Excavate removal within 2 days			
1.2	Generators	Satisfactory Maintenance regime followed Black smoke Leaking oil Drip pans not available			
1.3	Vehicles	Satisfactory PUC certificate available Black smoke Wheel washed /cleaned Leaking oil Side of vehicle clear of mud Material transported in closed manner			
1.4	Air monitoring	Carried out as per contract Result reported as per contract Remedial measures in place where required			
2.0	WATER POLLUTION				

2.1	Site drain	Drainage system functional No contamination Not blocked by debris/garbage No indications of oil spilled in drains Storage of chemical waste not nearby Storage of refuse / excavate muck not near the drains			
2.2	Adjacent Drains	Not damage No signs of pouring bentonite No signs of pouring chemicals No signs discharging Silt/ debris			
2.3	Separator tanks	Tank not full of silt Tank regularly emptied			
3.0	NOISE POLLUTION				
3.1	Noise control measure	All powered mechanical equipment's are sound reduced Acoustic / enclosures constructed in areas of excessive noise Equipment located and directed away from noise receptors			
3.2	Generators provided with acoustic enclosures	Effective / Not effective			
3.3	Noise monitoring	Carried out as per contract Not exceeded baseline values Remedial measure in place Results evaluated statistically for inclusion monthly report			
4.0	WASTE MANAGEMENT				
4.1	Waste identified	Chemical flammable corrosive construction related / oil / filters / batteries Hazardous Other (Specify)			
4.2	Storage containers & bins	Adequate number and properly place Proper quality Emptied regularly Labeling proper No spillage on container surface noticed Pollutants (e.g. waste chemical), not dumped into bins Recyclable (e.g. metal)not dumped in garbage bin			
4.3	Oil waste	Drip pans available No oil stains on ground Spill absorption material available Waste oil poured in to designated waste drums Used oil filters not dumped in garbage bin			

4.4	Excavate / musk	Storage satisfactory / properly secured Dumping in authorized areas No interference with nearby drainage			
5.0	STORAGE				
5.1	Diesel storage	Extensive diesel spillage on ground not visible Drip pans used when pumping diesel Pipes / connectors / pumps not leaking Not located close to storm water drains Transfer arrangement satisfactory			
6.0	AESTHETICS & CLEANANESS				
6.1	Housekeeping & Hygiene	Designated storage area for materials Scraps / brickbats / rubbish scattered at site Proper space for handling waste Area clean and dry Stagnant water treated weekly Proper staking of drums Barricades are clean, in line, firmly secured and proper earthing Water not allowed to accumulate in work area for any reason			
7.0	ROADS				
7.1	Access roads	Satisfactory maintenance In urgent need of maintenance			
7.2	Public roads used by contractor	Satisfactory maintenance Repair not carried out			

10.6 OPERATION PHASE

10.6.1 Temporary land acquisition

Redevelopment plan shall be completed/enforced for borrow areas used during construction. Any land acquired temporarily for construction purpose, transportation of material etc shall be redeveloped to the satisfaction of owner and affected productive area to be poured with top soil

10.6.2 Noise

Following mitigation measures shall be adopted in operation phase to Control Noise

- Horn prohibited signpost to be enforced;
- Maintenance of noise barriers shall be carried out if installed;
- Local people shall be discouraged from establishing sensitive receptors near the railway;
- Public shall be informed about the regulations on noise pollution;
- Monitoring of noise pollution shall be done regularly.

10.6.3 Soil erosion

During operation phase embankment slopes shall be re-vegetated and casualties shall be replaced. Any residual spoils shall be disposed properly.

10.6.4 Vibration

Following mitigation measures shall be adopted in operation phase to Control vibration

- Regular track maintenance ;
- Special track work to be designed;
- Vehicle modifications to be carried out to reduce vibration;
- If required changes in the track support system to be done;
- If required building modifications to be carried out;

10.7 ENVIRONMENTAL MONITORING PLAN

10.7.1 The Need

Monitoring is an integral part of any environmental assessment process. Railway development project creates a new environment with complex inter-relationships between people and natural resources. The magnitude of changes being created due to alteration of landscape, water, air and noise quality and other environmental parameters can be quantified and evaluated only by carrying out monitoring of various parameters during different phases of project construction and operation. The monitoring and evaluation of environmental parameters indicates potential changes occurring in the environment which paves way for implementation of rectifying measures wherever required to maintain the status of the natural environment. Evaluation is also a very effective tool to judge the effectiveness or deficiency of the measures adopted and provides insight for future corrections.

10.7.2 Environmental monitoring

The overall impact assessment of the proposed project was carried out and monitoring plans have been framed based on the severity of impacts in different areas. During the ESIA study it has been observed that the air quality and water quality are not going to be affected significantly and only, temporary changes in these parameters are expected. The preventive/ curative measures to reduce the ill effects of construction activities on these parameters have been suggested under various plans. A holistic approach has been adopted for monitoring of air, noise and water related factors under different heads with suitable financial provisions for their implementation. The work of Monitoring shall be assigned to any agency approved by MoEF&CC or CPCB/NABL. The detail of estimated budget for environmental monitoring plan is given in **Table 10.4**.

Table 10.4: Estimated Budget for Environmental monitoring plan for 5 Year (Construction Phase)

S. No.	Environmental Monitoring Parameter	Frequency of sampling/ year (A)	Number of Samples Location (B)	Total sample/year C=A*B	Total samples for 5 year (y) D=C*5 yr	Unit Rate (E)	Amount (inlacs) F= D*E
1	Air Quality	12	15	180	900	3500	31.5
2	Noise	52	15	780	3900	1500	58.5
3	Drinking Water Quality	4	10	40	200	2500	5
4	Ground Water	4	10	40	200	2500	5
5	Surface Water Quality	4	20	80	400	2500	10
6	Vibration			5	25	30000	7.5
Total							117.5

Note: It is assumed that 10 active sites any time, 5 Batching plant/construction yard, 5 Labour camps

10.8.1 IMPLEMENTATION ARRANGEMENTS

10.8.1 Background

Involvement of various institutions at different stages of project cycle will be required for implementation of EMP. This section deals with roles and responsibilities of various institutions for successful implementation of the EMP. The role of different stakeholders is defined in the following sections.

10.8.2 Executing Agency

The Government of Haryana (GoH) and Government of India (GoI) will be the executing agencies of the proposed Haryana Orbital Rail Corridor (HORC) project. The Managing Director of HRIDC will be responsible for overall execution of the ESMP. A Board of Directors is the apex decision making body. Chief Secretary, Government of Haryana is the Chairperson. The board members comprise the following:

- Managing Director, HRIDC
- ACS PWD (B&R), Govt. of Haryana
- ACS Finance, Govt. of Haryana
- Director, PSCM, Govt. of Haryana
- Director, CE(C), Northern Railway
- Director, Executive Director/Project Monitoring, Railway Board
- Director (Project & Planning), HRIDC
- Director (BD & Finance), HRIDC

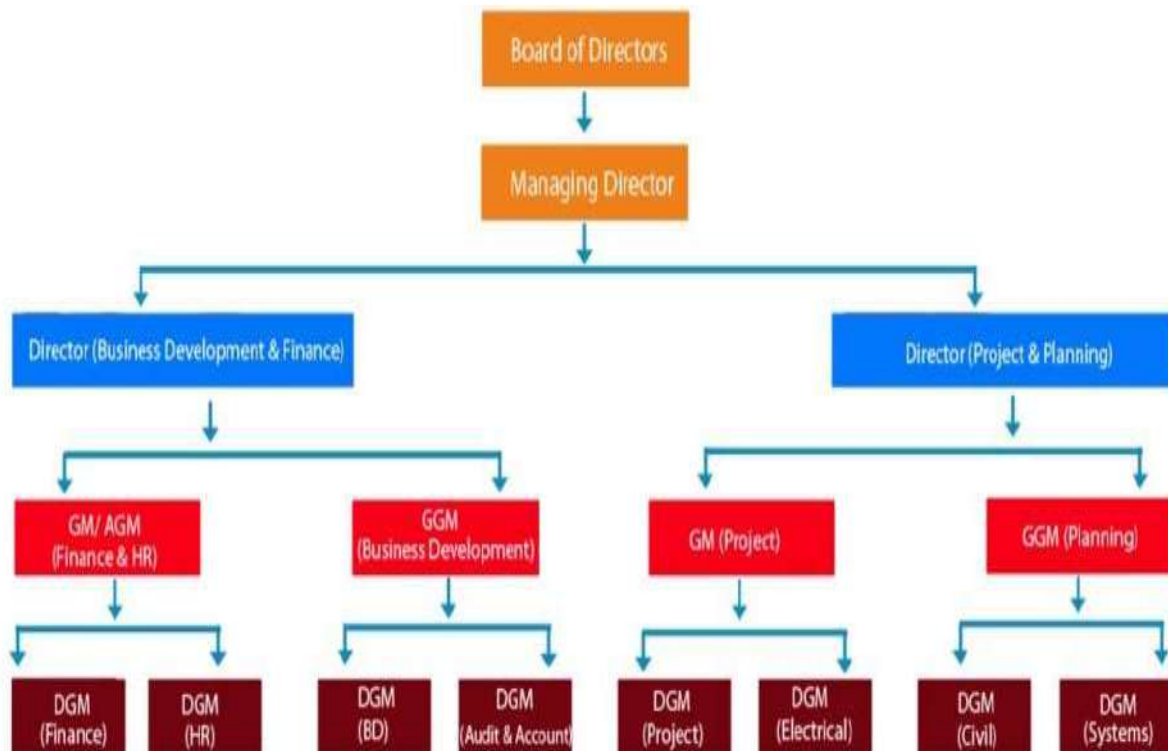


Figure 10.2: Implementation Arrangement

10.8.3 Implementing Agency (IA)

HRIDC is responsible for implementation of the proposed Haryana Orbital Rail Corridor (HORC) project. A Project Management Unit (PMU) will be set up within the HRIDC for the execution, monitoring and co-ordination among various agencies and consultants involved in the project. Chief Project Manager (CPM), HRIDC shall be the head of the PMU. One Nodal Officer of the level of Dy. General Manager (DGM) has been nominated by the CPM for dealing with E&S issues. The Environment and Social Experts of GC will work under the overall guidance of CPM, PMU and in close co-ordination with ESIA consultant, Competent Authorities, M&E consultant, and other relevant agencies or individuals involved in the project.

CPM, HRIDC will be overall responsible for the successful implementation of ESMP as head of the PMU. However, for all practical purposes nominated Nodal Officer shall be directly responsible for implementation of ESMP. CPM, PMU will have delegated administrative and financial powers for the implementation of ESMP. The overall institutional arrangement for ESMP implementation is presented in **Figure 10.3**.

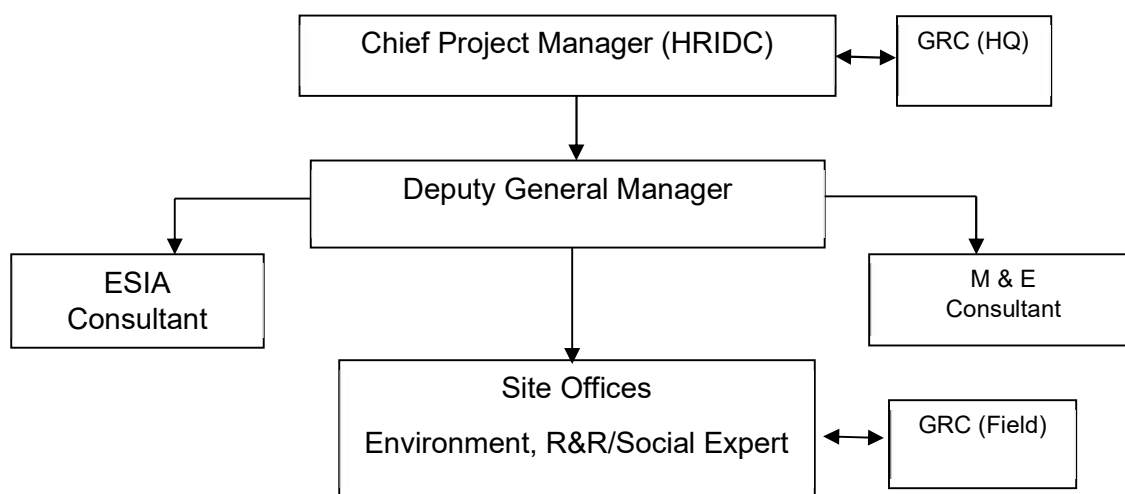


Figure 10.3: Institutional Arrangement for ESMP Implementation

10.8.4 Implementation of ESMP

HRIDC: ESMP will be committed by HRISDC as part of its agreement with AIIB. The responsibility to implement the ESMP including Grievance Redressal rests with HRIDC. Environment clearances related to locations and design of the project will be secured before start of construction.

Contractors: Permits required during construction and those directly related to construction will be taken by Contractor. The ESMP will be implemented by the contractors of different packages based on the contract agreement. The contractor environmental and social team will be headed by environmental and social experts assisted by qualified and trained environment engineers and social experts. Contractor will be responsible for baseline environmental monitoring at the beginning of the project

The Employer Requirements for ESHS have been prepared for the project. This will be issued to the Contractor as part of the contract documentation for construction.

HRIDC and GC: Supervision and review of implementation will be the responsibility of GC. With assistance from GC, HRIDC will also be responsible for reviewing and approving any specific documents/plans that have to be provided by contractors (ESHS Plan, waste management plan, muck disposal plan etc.). Implementation of ESMP will be continuously monitored by the ESHS team of GC and HRIDC. The HRIDC-GC team will be common for all packages of the project with a view to facilitate unified approach and knowledge enhancement. The broad roles and responsibilities of Environment and R&R/Social Experts of GC are as under:

A) Environment:

- Preparation of Environmental Management Manual
- Review and approve the Contractors Environment Management Plan (C-EMP), including all updates and revisions (not less than once every 6 months);
- Update Environmental management plan including corrective measures;
- Compliance to environment mitigation plan during the Construction Period
- Ensure compliance of Environmental safeguards
- Responsible for compliance of all environmental safeguard aspects in accordance with all applicable Government laws and policies, and AIIB requirements
- Planning, Implementation, Monitoring, Reporting on Environmental Safeguards requirements including assessments, plans, and measures
- Assist in obtaining all necessary approvals and clearances from statutory and relevant authorities.

B) Social:

- Ensure documentation of census & socio-economic surveys,
- Ensure robust assessment of social impacts particularly impacts on vulnerable group,
- Ensure documentation of consultations with different groups of affected persons specifically vulnerable groups,
- Ensure timely preparation of SIA and RP and other reports and review reports before submission to AIIB for observations and clearance,
- Ensure successful implementation of RP,
- Coordinate timely transfer of land area and availability of private land area for project work,
- Make efforts to obtain no objection certificates from concerned agencies wherever applicable,
- Ensure timely public disclosure of all safeguards' documents,
- Provide guidance and necessary help to site officials in matters related to rehabilitation and resettlement activities,
- Ensure redressal of grievances by suitably coordinating with GRC members and project affected persons for timely GRC meetings,
- Ensure documentation and monitoring of all these above aspects through a detailed checklist,
- Ensure delivery of entitlements to project affected persons in transparent and timely manner,
- Ensure compliance to legal framework and AIIB's requirements,
- Prepare various reports from time to time as required covering physical and financial progress and other aspects of RP implementation,
- Undertake initiatives for capacity-building trainings of personnel involved in RP implementation on an on-going basis. PMU, HRIDC will engage external consultants on a need basis to support the capacity building efforts, if required.

AIIB: Disclosure of all latest safeguard documents on their websites. Implementation of the ESMP will be monitored half yearly by AIIB through their specialists.

External Monitor: An external monitor will be engaged by HRIDC in consultation with AIIB to evaluate the environmental performance of above-mentioned parties with the listed responsibilities as below:

- To conduct third party monitoring of environmental and social compliance under the project;
- To ensure that the Project will be implemented in conformity with the policies of GoI, GoH, as well as AIIB policies;
- To Identify any safeguard related implementation issues and necessary corrective actions and reflect these in a time-bound corrective action plan for HRIDC to implement;
- Capturing social, environmental and economic benefits and particular potential benefits to the poor and vulnerable groups in the corridor;
- Involving users and stakeholders in the monitoring process; and
- Strengthening the capacity of the HRIDC to manage and replicate third-party monitoring with rail users and stakeholders.

The agency will report to HRIDC who in turn report it to AIIB. The external monitor will conduct independent monitoring to inform HRIDC any remediation actions to ensure the safeguard compliance.

10.9 CAPACITY BUILDING

HRIDC has engaged General Consultant at initial stage of Project for Environment Management, land acquisition and implementation of RAP and ESMP. The GC team will have following experts for implementation of Environment and social management:

- Environment Expert (1 No)
- Assistant-Environmental experts (2 Nos)
- R&R/Social Expert (2 Nos)
- Assistant – R&R/ Social Expert (3 Nos)

Contractors of each construction package will be having a team for Implementation of ESMP which will be headed by an Environmental and Social Expert.

Training: Training is an investment made on the human resource of the organization to provide and one the competencies, required to do an existing job well and also to perform for future needs. Targeted and monitored training can set up an environment of good morale and productivity and contributes in creating a powerhouse of competencies for the organisation.

HRIDC and GG: It is proposed to conduct a training program for HRIDC as well as general consultant environmental, health and safety officials particularly on AIIBs' monitoring and reporting requirements. External monitor will undertake training and capacity building activities. Training modules will be discussed and confirmed by HRIDC and AIIB. The need for additional and specialised training shall be examined and appropriate training will be undertaken as required.

Contractor: The Contractor shall organize the ESHS training to engage managers, supervisors and other personnel in behavioral change and improve safety performance. The Contractor shall provide a training/workshop on ESHS to all its workers/staff/employees/subcontractors of at least 2 days. It shall be completed invarious modules and each employee/worker shall have a record of completing allmodules. The contents of ESHS training to managers/supervisors is included in Tender document.

10.10 SUMMARY OF EMP BUDGET

EMP budget is estimated for the project and given in Table below. This will compensate, mitigate and minimize the negative impact of the project and enhance the positive impact of the project.

Table 10.5: Summary of EMP Budget

S. No.	EMP Components	Amount (in Lakhs)	Reference
1	Compensatory Afforestation Plan	172.028	Point 10.4.6
2	Dust Suppression Plan	670.00	Point 10.5.3
4	Debris Disposal Plan	39.00	Table 10.5.5
5	Solid and Liquid Waste Management Plan	12.00	Point 10.5.7
6	Health and Hygiene Plan	25.00	Point 10.5.14
7	HIV/AIDs Prevention Plan	50.00	Point 10.5.15
8	Action plan for conservation of peafowl	21.00	Point 10.5.16
9	Noise Pollution Prevention and Control Plan	10.00	Point 10.5.4
10	Bio-diversity Management Plan	10.00	Point 10. 5.20
11	Environmental Monitoring Cost	117.50	Table 10.5
A	Total	1126.53	
13	EMP Implementation Expenses		
B	Environmental Expert 1 (No) and Assistant Environment Expert (2 Nos)	123.66	
C	Total (A + B)	1250.19	

Table 10.6: Environmental Management Plan-Design, Construction and Operation

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
Pre- Construction Stage (Location and Design Phase)					
1.	Alignment	HRIDC will ensure that for any tender for civil work of the Project, an analysis of possible alternatives and alignment adjustments will be done in order to minimize the environmental and social impacts.	Significant	DPR and design consultant	HRIDC
2.	Loss of trees and water bodies	Alignment is so designed to avoid or minimize maximum impacts on trees and nearby water bodies in line with Forest Conservation Act 1980 & Water (Prevention and Control of Pollution) Act, 1974.	Significant	DPR and design consultant/GC	HRIDC
3.	Design provision for safety of structures against earthquake, fire, and floods etc.	Considering the worst - case scenario and force factors in the probability of an earthquake, fire, and floods etc. the station design and rail network alignment are designed considering safety of structures.	Significant	DPR and design consultant	HRIDC
4.	Archaeological Monuments	No Impact on legally protected Archaeological Monuments due to proposed alignment; accordingly, Ancient Monuments and Archaeological sites and Remains Act, 1958 amended in 2010 is not triggered. Though no cultural heritage is found in the Project area, should the case arise, HRIDC and the contractors shall apply measures that meet applicable national legislation related to Cultural Heritage.	Insignificant	DPR and design consultant	HRIDC
5.	Site measures	Prepare a manual in line with AIIB guidelines and National regulations on aspects of Environment, Social, Health and Safety (ESHS).	Insignificant	GC	HRIDC
6.	Disclosure	As a feedback measures from various stakeholders the EMP/ EMOp will be disclose to everyone and necessary revision and measures will be discussed and incorporated in the EMP/EMOp if necessary.	Insignificant	HRIDC	HRIDC
7.	Environmental Management and Monitoring	For management and monitoring of environmental, institutional implementation of EMP and EMOp will be carryout.	Significant	HRIDC	HRIDC
Construction stage					

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency														
1.	Permissions/ Approvals	<p>Various environment clearances to be taken from the concerned agencies as presented in Table below:</p> <table border="1"> <thead> <tr> <th>Clearance/ Permission//Permit</th> <th>Concerned Agency</th> </tr> </thead> <tbody> <tr> <td>Consent to Establish and Consent to Operate batching plants</td> <td>Haryana Pollution Control Board</td> </tr> <tr> <td>Authorization for generation, handling, storage and transportation of hazardous waste</td> <td>Haryana Pollution Control Board</td> </tr> <tr> <td>Permission for extraction of ground water</td> <td>Central Ground Water Authority</td> </tr> <tr> <td>Pollution Under Control Certificate</td> <td>Department of Transport, Government of Haryana</td> </tr> <tr> <td>Management Plan for Construction and Demolition Waste (C&D)</td> <td>Local Authority (Municipal Corporation)</td> </tr> <tr> <td>Cutting of trees</td> <td>Forest Department, Haryana</td> </tr> </tbody> </table>	Clearance/ Permission//Permit	Concerned Agency	Consent to Establish and Consent to Operate batching plants	Haryana Pollution Control Board	Authorization for generation, handling, storage and transportation of hazardous waste	Haryana Pollution Control Board	Permission for extraction of ground water	Central Ground Water Authority	Pollution Under Control Certificate	Department of Transport, Government of Haryana	Management Plan for Construction and Demolition Waste (C&D)	Local Authority (Municipal Corporation)	Cutting of trees	Forest Department, Haryana	Insignificant	Contractor	GC
Clearance/ Permission//Permit	Concerned Agency																		
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Pollution Under Control Certificate	Department of Transport, Government of Haryana																		
Management Plan for Construction and Demolition Waste (C&D)	Local Authority (Municipal Corporation)																		
Cutting of trees	Forest Department, Haryana																		
2.	Removal of Utilities	<ul style="list-style-type: none"> • Prior to start of construction activities, the utility services (electrical cables, telephone line, water supply pipeline, gas supply pipeline and internet line etc.) to be shifted based on consultation with relevant organizations; • Informing local community before starting removal or demolishing work; • Carefully removing the utilities that are connected to any structures; • Proper Health and safety measures for all the workers to be taken during shifting of these utilities to avoid any incidents. 	Insignificant	Contractor	GC														
3.	Dismantling	<ul style="list-style-type: none"> • Notifying the adjacent community before start of demolishing work; • Spraying water in the dry land or from where there is a possibility of dust generation; • Provision of PPE kits such as helmet, earplug, musk, safety shoes, hand gloves etc. to every worker to avoid any accidents. • Constructing noise barrier around the dismantling site; • Shutting down operation of engine when it is not required; • Monitor Noise level as per CPCB guidelines. 	Moderate	Contractor	GC														
4.	Setting up labour camps	<ul style="list-style-type: none"> • Labour camp to be constructed at a distance from the water bodies; • Locate labour camp away from the settlement and avoid productive land; • No solid and liquid waste to be discharged into the water bodies; • Instructing workers to maintain a clean environment in & around the camps. 	Insignificant	Contractor	GC														
5.	Soil Erosion and Sedimentation control	<ul style="list-style-type: none"> • Plan activities so that no bare/ loose earth surface is left out before the onset of monsoon; • Embankment slopes to be covered, soon after completion; 	Insignificant	Contractor	GC														

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> Top soil from borrow area, debris disposal sites, construction site to be protected/covered for soil erosion; Debris due to excavation of foundation, dismantling of existing cross drainage structure to be removed from the water course immediately. 			
6.	Loss of agricultural topsoil	<ul style="list-style-type: none"> Top soil to be stripped to a depth of 20 cm from the areas to be disturbed; Top soil to be stockpiled to a maximum height of 40 cm in designated areas, covered or stabilized with temporary seeding for erosion prevention and to be reapplied to site during plantation of the proposed vegetation; Topsoil to be separated from subsoil, debris and stones larger than 50 mm diameter; Topsoil to be used as finished grade for planting areas; Covering all borrow areas after excavation is over; Dressing of slopes of embankment. 	Insignificant	Contractor	GC
7.	Soil pollution and Damage to vegetation	<ul style="list-style-type: none"> Construction vehicles to be operated within the Corridor of Impact to avoid any damage to nearby soil and vegetation. Diversions, access road used are to be redeveloped to the satisfaction of the owner/villagers; Implementing measures to prevent ingress of toxic/heavy metals in soil Suitable storage area to store such material to be prepared and equipments to be made available for handling these materials; Taking all necessary precautions such that diesel, grease, waste oil, chemicals etc. does not spill on ground; Regular monitoring of groundwater and soil leachate at muck disposal areas where possibility of ground water contamination is anticipated. 	Insignificant	Contractor	GC
8.	Air pollution	<ul style="list-style-type: none"> Careful planning, timing of cut and fill operations and re-vegetation shall be practice to reduce the Soil Erosion and dust generation; Disposing the muck/dry soil generated at construction site at a location which is mutually agreed between concerned agency and HRIDC A wash pit or a wheel washing and/or vehicle cleaning facility to be provided at the exits from work sites such as construction depots and batching plants. Sufficient staff to be made available at site to manage the generated muck/soil from site such as a supervisor, labors for wheel cleaning; brooms for wheel cleaning and concrete pad where wheels will be cleaned; The dumpers carrying the muck/dry soil to be covered while plying on the roads on the way to storage location; Placing the material in a manner that will minimize dust production. Material to be stabilized each day by watering or other accepted dust suppression techniques; Providing water sprinkling at any time that it is required for dust control use; Effective water sprays to be used during the delivery and handling of all raw sand and aggregate and other similar materials, where dust is likely to be generated and to dampen all stored materials during dry and windy weather; 	Insignificant	Contractor	GC

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency									
		<ul style="list-style-type: none"> • Depots and batching plants shall have an approved hard surface that is kept clear of loose surface material; • Vehicle speed to be restricted to 15 Kmph; • Use of blast nets, canvas covers and watering during blasting operations; • Use of wire mesh made of heavy-duty tyres or sand bags to prevent flying rock and reduce dust; • Air monitoring to be carried out as per following details: <table border="1"> <thead> <tr> <th>Parameters</th> <th>Location</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>Air (PM₁₀, PM_{2.5})</td> <td>One representative location within each construction yard and batching plant</td> <td>Monthly</td> </tr> <tr> <td></td> <td>Closest residential or commercial area (one location) within 100 m from each active construction site or representative locations approved by the Engineer</td> <td>Monthly</td> </tr> </tbody> </table> <p>Air Quality monitoring cost for 5 years is Rs. 31.50 Lacs.</p>	Parameters	Location	Frequency	Air (PM ₁₀ , PM _{2.5})	One representative location within each construction yard and batching plant	Monthly		Closest residential or commercial area (one location) within 100 m from each active construction site or representative locations approved by the Engineer	Monthly			
Parameters	Location	Frequency												
Air (PM ₁₀ , PM _{2.5})	One representative location within each construction yard and batching plant	Monthly												
	Closest residential or commercial area (one location) within 100 m from each active construction site or representative locations approved by the Engineer	Monthly												
9.	Water Pollution	<ul style="list-style-type: none"> • Temporary drainage works to be maintained at construction depots and batching plants; • Construction of drainage system during the commencement of the works to drain off all surface water at the site into nearby drainage system; • Provision of sedimentation tanks to trap silt-laden water from all civil works before discharge into the outlet drain; • The temporary excavated materials meant for backfilling to be covered with tarpaulin during rainy season or at any time of the year when rainstorms are likely; • Preventing soil particles and debris from entering the wells or water discharge points by use of filters and sedimentation basins as required; • Ensuring that all existing stream courses and drains within and adjacent to the site are kept safe and free from any debris and any excavated materials arising from the works; • Discharging wastewater arising from site offices, canteens or toilet facilities constructed by contractor into sewers after obtaining prior notice of no objection of agency controlling the system; • Provision of oil separator/interceptors at Batching Plant and Construction Depot location for vehicle maintenance; • Earth, bentonite, chemicals and concrete agitator washings etc. are not to be deposited/drained in the watercourses but to be suitably treated and effluents and residue disposed off in a manner approved by local Regulatory Authorities; • Minimize soil excavation works in rainy season; • Covering of temporarily exposed slope surfaces by tarpaulin in rainy season; 	Insignificant	Contractor	GC									

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency												
		<ul style="list-style-type: none"> Protection of temporary access roads by crushed stone or gravel in rainy season; Wherever possible recycling of wastewater generated from washing down of mixer trucks and drum mixers, concrete batching & precast concrete Casting; Segregation of surface run-off from the concrete batching plant and casting yard area as much as possible and diverting it to the storm water drainage system; Treating surface run-off contaminated by materials in concrete batching plant or casting yard within the discharge norms before disposal into storm water drains; Prior approval from appropriate authority for installing bore wells for water supply at site; Water monitoring to be carried out as per following details: <table border="1"> <thead> <tr> <th>Parameters</th> <th>Location</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td> Drinking/Ground Water (pH, Total Alkalinity, Electrical Conductivity, Total Dissolved Solids, Fluoride, Arsenic, Nitrate, Iron,, Lead, Cadmium, E-coli) </td> <td> Drinking water: construction yard, batching plant and labour camps </td> <td>Quarterly (April, July, October, January)</td> </tr> <tr> <td></td> <td> Groundwater: one representative tube/bore well in the adjacent residential area or within 100m from each active construction site </td> <td>Quarterly (April, July, October, January)</td> </tr> <tr> <td> Surface Water pH, Total Dissolved Solids, Fluoride, Arsenic, , Iron, , Lead, , E-coli </td> <td> Upstream and downstream of the river/stream if any. Any natural water course (ex. Pond etc.) located or within 100 m of each a) construction yard, b) labour camp, and c) active construction site </td> <td>Quarterly (April, July, October, January)</td> </tr> </tbody> </table> <p>Drinking water, ground water and surface water quality monitoring cost for 5 year is 20.00 Lacs.</p>	Parameters	Location	Frequency	Drinking/Ground Water (pH, Total Alkalinity, Electrical Conductivity, Total Dissolved Solids, Fluoride, Arsenic, Nitrate, Iron,, Lead, Cadmium, E-coli)	Drinking water: construction yard, batching plant and labour camps	Quarterly (April, July, October, January)		Groundwater: one representative tube/bore well in the adjacent residential area or within 100m from each active construction site	Quarterly (April, July, October, January)	Surface Water pH, Total Dissolved Solids, Fluoride, Arsenic, , Iron, , Lead, , E-coli	Upstream and downstream of the river/stream if any. Any natural water course (ex. Pond etc.) located or within 100 m of each a) construction yard, b) labour camp, and c) active construction site	Quarterly (April, July, October, January)			
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10.	Noise and Vibration	<ul style="list-style-type: none"> Minimize the use of impact devices, such as jackhammers, and pavement breakers; Wherever possible use concrete crushers or pavement saws for tasks such as concrete deck removal and retaining wall demolition; Use of acoustically attenuating shields or shrouds on noise producing equipment such as jackhammers and pavement breakers recommended by the manufacturers; Provision of intake and exhaust mufflers for pneumatic impact tools and equipment as recommended by the manufacturers; 	Significant	Contractor	GC												

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> • Providing mufflers or shield paneling for other equipment's, including internal combustion engines; • Employing prefabricated structures instead of assembling on-site; • Use of electric instead of diesel-powered equipment; • Use of hydraulic tools instead of pneumatic impact tools; • Maximizing physical separation, as far as practicable, between noise generators and noise receptors such as i) providing enclosures for stationary items of equipment and barriers around particularly noisy areas on site, ii) locating stationary equipment in such a way, so as to minimize noise and vibration impact on community; • Configuring the construction site in such a manner that noisier equipment and activities are as far as possible away from noise sensitive locations and nearby buildings; • Orienting plant and equipment emitting noise in one direction in a direction away from noise sensitive receptor; • Reducing the number of plant and equipment operating in critical areas close to noise sensitive receptors; • Scheduling truck loading, unloading, and hauling operations in such a way so as to minimize noise impact near noise sensitive locations and surrounding communities; • Planning noisier operations during times of highest ambient noise levels; • Keeping noise levels relatively uniform; • Avoiding excessive and impulse noises; • Not to be keep equipment and plant idling when not in use; • Use of only well maintained plant/equipment at site; • Scheduling work to avoid simultaneous activities that generate high noise levels; • If back-up alarms are used on construction equipment, keep their noise emission level near noise sensitive receptors within regulated limits especially at night time; • Selecting truck routes for muck disposal in such a manner so that truck noise will have minimal impact on sensitive areas; • Bringing down the noise levels due to the DG set within the ambient noise requirements by proper setting and control measures; • Obtaining all necessary permissions/ approvals/consent from relevant authorities before installation and operation of Generator set; • Routine and preventive maintenance procedure for the DG set; • At all times noise levels due to construction activities/DG sets etc. shall comply the standards set out by CPCB/SPCB; • Maintain equipment such that parts of vehicles and loads are secure against vibrations and rattling; • Grading of surface irregularities on construction sites to prevent the generation of impact noise and ground vibrations by passing vehicles; 			

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency												
		<p>• Noise and vibration monitoring to be carried out as per following details:</p> <table border="1" data-bbox="436 396 1383 922"> <thead> <tr> <th data-bbox="436 396 816 423">Parameters</th> <th data-bbox="816 396 1173 423">Location</th> <th data-bbox="1173 396 1383 423">Frequency</th> </tr> </thead> <tbody> <tr> <td data-bbox="436 423 816 724"> Noise Day Time (6 AM – 10PM) L_{max}, L_{min}, L_{eq}, L₁₀, L₉₀, L₅₀ Night Time (10PM – 6AM) L_{max}, L_{min}, L_{eq}, L₁₀, L₉₀, L₅₀ </td> <td data-bbox="816 423 1173 724"> One representative location within each construction yard and batching plant </td> <td data-bbox="1173 423 1383 724"> Weekly </td> </tr> <tr> <td data-bbox="436 724 816 862"></td> <td data-bbox="816 724 1173 862"> Closest residential or commercial area (one location) within 100m from each active construction site or representative locations approved by the Engineer </td> <td data-bbox="1173 724 1383 862"> Weekly </td> </tr> <tr> <td data-bbox="436 862 816 922"> Vibration (in mm/s or VdB) </td> <td data-bbox="816 862 1173 922"> During complaints or as directed by employer. </td> <td data-bbox="1173 862 1383 922"></td> </tr> </tbody> </table> <p>Noise monitoring cost is Rs. 58.50 lakhs and vibration monitoring cost is Rs. 7.50 lakhs. Vibration will be carried out in case of complaint, if any.</p>	Parameters	Location	Frequency	Noise Day Time (6 AM – 10PM) L _{max} , L _{min} , L _{eq} , L ₁₀ , L ₉₀ , L ₅₀ Night Time (10PM – 6AM) L _{max} , L _{min} , L _{eq} , L ₁₀ , L ₉₀ , L ₅₀	One representative location within each construction yard and batching plant	Weekly		Closest residential or commercial area (one location) within 100m from each active construction site or representative locations approved by the Engineer	Weekly	Vibration (in mm/s or VdB)	During complaints or as directed by employer.				
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	Closest residential or commercial area (one location) within 100m from each active construction site or representative locations approved by the Engineer	Weekly															
Vibration (in mm/s or VdB)	During complaints or as directed by employer.																
11.	Waste	<p>General Refuse</p> <ul style="list-style-type: none"> Burning of wastes will be prohibited. The Contractor not to burn debris or vegetation or construction waste on the site; The refuse to be stored and transported in accordance with good practice and disposed at licensed landfills; General refuse to be stored in enclosed bins or units and must be separated from construction and chemical wastes; Authorized waste collector to remove general refuse from the site on a daily basis to minimize odour, pest and litter impacts. <p>Construction and Demolition Waste</p> <ul style="list-style-type: none"> Construction & Demolition (C&D) waste to be stored at a designated area; The C&D waste to be disposed off in a manner in compliance with the procedure given in the Construction & Demolition Waste Management Rules, 2016; 	Insignificant	Contractor	GC												

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> • Collection, segregation and storage of construction and demolition waste will be as directed or notified by the concerned local authority in consonance with the Construction & Demolition Waste Management Rules, 2016; • Other waste no to be mixed with this waste and to be stored and disposed separately; • The C&D waste to be disposed only at authorized processing facilities and ensuring that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains; • No disposal of C&D waste along the riverbed, natural drainage and wet land; • C&D waste to be disposed from the entire contract either when 15 Tons of C&D waste has been generated or such C&D waste has been stored for 15 days (irrespective of quantity), whichever is earlier; • Record keeping to be maintained to ensure disposal of C&D waste to C&D waste recycling plant. <p>Hazardous Waste</p> <ul style="list-style-type: none"> • Hazardous waste to be disposed off in a manner in compliance with the procedure given in the Hazardous Waste (management, handling and trans-boundary movement) rules, 2016; • Chemicals classified as hazardous chemicals under “Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 of Environment (Protection) Act, 1986 to be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act; • Hazardous waste to be dispose off to authorized dealers by applying to State Pollution Control Board for ‘authorization’ according to Form 1 of the Hazardous Waste (Management & Handling) Rules; • The hazardous waste to be stored on an impermeable surface with containment bunding to retain leaks, spills and ruptures; • All waste collection containers to be of appropriate size with a closed lid; • Each container to be clearly labelled both with a colour code system and labelled in local language and English. <p>Bio medical waste</p> <ul style="list-style-type: none"> • No mixing of Biomedical Waste & General Waste; • Storage time of waste to be as less as possible so that waste storage, transportation and disposal is done within 48 hours; • All bags or containers containing segregated bio-medical waste to be labelled (including bar code) as per Bio Medical Waste Rules before disposal; • Ensuring adequate number of colour coded bins/containers or bags to be available at the point of generation of bio-medical waste; • Ensuring posters/ placards for bio-medical waste segregation to be installed at the point of generation; 			

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency									
		<ul style="list-style-type: none"> General waste not to be collected at the same time or in the same trolley in which bio-medical waste is collected; Disposal of biomedical waste to be through a licensed waste collector, duly authorized by MoEFCC or Haryana Pollution Control Board as the case may be; Staff collecting Bio-medical waste to be provided with PPEs. <p>Storage and Segregation of Waste</p> <ul style="list-style-type: none"> Collection and storage points to be established around all construction work sites. The waste containers shall be of at least 50L/100L; Different areas of the worksites to be designated for such segregation and storage wherever site conditions permit; Displaying board outside the storage area, to display quantity and nature of waste; Segregation of Waste to be done on site; Wet/organic/bio-degradable waste to be stored in green bins, dry/recyclable waste (excluding bio-medical waste/ hazardous waste) in blue bins, bio-medical waste in red bins, e-waste in black bins, hazardous waste in brown bins and COVID waste in yellow colour bin; <p>Waste monitoring to be done as per following details:</p> <table border="1"> <thead> <tr> <th>Parameters</th> <th>Location</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>Waste Sampling standard not available but fully complying with monitoring the quantities of wastes specified by the Solid Management Rules 2016 & the Construction and Demolition Waste Management Rules 2016</td> <td>Each construction yard and construction site</td> <td>Quarterly (April, July, October, January)</td> </tr> <tr> <td>Hazardous waste Sampling standard not available but typed reporting (not hand writing) fully complying with monitoring the quantities of wastes specified by the Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016,</td> <td>Each construction yard and active construction site</td> <td>Quarterly (April, July, October, January)</td> </tr> </tbody> </table>	Parameters	Location	Frequency	Waste Sampling standard not available but fully complying with monitoring the quantities of wastes specified by the Solid Management Rules 2016 & the Construction and Demolition Waste Management Rules 2016	Each construction yard and construction site	Quarterly (April, July, October, January)	Hazardous waste Sampling standard not available but typed reporting (not hand writing) fully complying with monitoring the quantities of wastes specified by the Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016,	Each construction yard and active construction site	Quarterly (April, July, October, January)			
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12.	Housekeeping	<ul style="list-style-type: none"> Each section of work site to be maintained reasonably clean, keep free from obstruction, and properly store any construction equipment, tools, and materials; 	Insignificant	Contractor	GC									

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> • Any wreckage, rubbish to be temporarily stored in wreckage and rubbish bins. These wreckage and rubbish bins to be cleaned at frequent intervals. • Special housekeeping group to ensure daily cleaning work at the site and its surrounding areas; • General housekeeping to be carried out and ensured at all times at work sites, Labour Camps, Stores and Offices; • Full height fence, barriers etc. to be installed at the site in order to preserve the surrounding area from excavated soil, rubbish etc. which may cause inconvenience to public; • Imparting the necessary introduction and education training through daily pre-work meeting (toolbox talk), safety meeting etc. to labour on housekeeping; • Other staff such as supervisors and engineers working at the site also to be educated on the necessity of good housekeeping; • At Work Site, all workers to clean their work place after completion of their job. Supervisor shall ensure good housekeeping of their respective work area through their workers; • At Labour Camp, all workers have to maintain good housekeeping and hygienic condition in their respective rooms/dormitories; • Ensuring the availability of dustbins at required place and regular cleaning of rooms, kitchens, toilet blocks and dustbins; • Arrangement for regular fumigation to be made; • At Store, proper access and stacking shall be ensured. A list to be displayed showing daily stock of materials. All work material to be stored in clearly marked containers or at designated storage area; • At Office, everyone will be responsible to maintain housekeeping of their work station. Disposal of waste materials (i.e., stationary, cigarette butts, tea bags etc.) must be in dustbin only. 			
13.	Avoidance of nuisance	<ul style="list-style-type: none"> • Following site clearing and before construction, remove all trash, debris and other weeds; • Ensuring that the work place is free of trash, garbage, debris and weeds; • Providing at site, metal or heavy-duty plastic 'Refuse Containers' with tight fitting lids for disposal of all garbage or trash associated with food; • Specific locations to be designated for consuming food and snacks to prevent random disposal of waste; • All waste to be deposited in the refuse containers; • Suitable all-weather signage to be prominently displayed for compliance of these requirements; • The refuse containers to be kept upright with their lids shut. These containers to be emptied at least once daily to maintain site sanitation; • All plants/equipment/machinery to be well maintained by regular servicing and kept free from oil/grease dripping; • Drip pans of suitable size to be used to collect oil leakages and spills. The area to be cleaned after completion of maintenance/repair and generated waste disposed off in approved manner; 	Insignificant	Contractor	GC

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> Material Supply Data sheet (MSDS) to be made available for material/chemicals/substances to the Engineer when requested; All material/chemicals/substances used to be treated, handled, stored, transported and disposed off, in a manner specified in the MSDS. 			
14.	Quarries and Borrow Pits	<ul style="list-style-type: none"> No borrow pit to be opened without the permission of Engineer; Written approval from owner to be taken and submitted to Engineer; Borrow pits to be identified outside the ROW; Before opening additional borrow pits, operating pits to be closed as per Specification; Borrow areas to be preferably selected from high land and/or waste land where farmers are willing to lower their area for cultivation purposes; Restore disturbed areas as soon as possible by vegetation. <p>For filling up of borrow area an estimated budget of 1.4 lacs for 5 year plan is proposed with total no of borrow pit sample as 70 numbers @ 2000 Rs unit rate.</p>	Significant	Contractor	GC
15.	Alteration of drainage	<ul style="list-style-type: none"> Diversions to be constructed during dry season, with adequate drainage facility, and to be completely removed before the onset of monsoon; Debris generated due to the excavation of foundation or due to the dismantling of existing structure to be removed from the water course; Silt fencing to be provided on the mouth of discharge into natural streams; Continuous drain (lined/unlined) to be provided; Obstruction if any, to be removed immediately. 	Significant	Contractor	GC
16.	Construction water availability	<ul style="list-style-type: none"> Provide list of sources (surface/ground) for approval from Engineer; Prior to use of source, written permission to be obtained from authority to use the water in construction activity, and submit a copy to Engineer; During construction only permitted quantity (permission taken) from approved sources to be used in construction activity; Water bodies not to be used for drawing or disposal of water during construction; Water should be clean and free from injurious substances; Consent from authority to be taken before digging new tube-well; Steps to be taken for minimization water wastage during construction. 	Insignificant	Contractor	GC
17.	Landscape, Greenery and Aesthetics	<ul style="list-style-type: none"> Maintaining ecological balance by preventing deforestation and defacing of natural landscape; Construction operations to be undertaken so as to prevent any avoidable destruction, scarring or defacing of natural surroundings in the vicinity of work; Where destruction, scarring, damage or defacing may occur as a result of operations relating to permanent or temporary works, the same to be repaired, replanted or otherwise corrected. All work areas to be smoothed and graded in a manner to conform to natural appearance of the landscape; Lighting and glare due to lighting used for construction to be prevented from striking adjacent areas, where feasible, through directional shielding; 	Insignificant	Contractor	GC

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> Erecting decorative screen hoarding prominently displaying the logo of HRIDC; Minimizing height of temporary buildings; Careful positioning of construction equipment; Eliminating the possibility of stockpiles of material from being visible to public; Strategically placing hi visibility site markings at construction sites indicating facilities, offices and stores; Adequate and properly managed parking of vehicles at construction depots and batching plants. 			
18.	Tree cutting	<ul style="list-style-type: none"> Tree felling permission to be obtained from Forest Department, Government of Haryana in line with Punjab Land Preservation Act, 1900; Identify the number of trees that are required to be felled as a result of construction of works and facilities related to project; All trees and shrubs, which are not specifically required to be cleared or removed for construction purposes, to be preserved and to be protected from any damage that may be caused by construction operations and equipment; No felling, removal or disposal of any tree or forest produce in any land handed over for construction of works and facilities related to project except with the previous permission obtained from the Forest Department; Special care to be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage or other operation. Adequately protect such trees by used of protective barriers or other methods; Trees not to be used for anchorage; Biomass shall not be stored at site for more than 15 days. 	Significant	Contractor	GC
19.	Energy Management	<ul style="list-style-type: none"> Use of energy efficient motors and pumps; Use of energy efficient lighting, which uses energy efficient luminaries; Adequate and uniform illumination level at construction sites suitable for the task; Use of proper size and length of cables and wires to match the rating of equipment; Use of energy efficient air conditioners; Optimizing the use of tools and plants and equipment to perform tasks with correct power. Optimizing cable sizes and joints can control voltage drops; Using energy efficient pumps (at least 80% efficiency) and motors (95% efficiency or more). The efficiency to be measured during installation and also periodically; Diesel Generating sets should have specific fuel consumption of at least 3.5 units per litre of diesel. The maintenance regime of his DG sets to be rigorously followed; Maximize the use of energy efficient luminaries such as LED's, metal halide lamps and similar and ensure optimum illumination levels to save energy. Provision of Earth Leakage Circuit Breakers (ELCBS) to be made to prevent loss of excessive earth currents which are unsafe; 	Insignificant	Contractor	GC

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> • Planning in advance and selecting locations to receive and store material such that these are at the least distance from place of use. Such an approach will result in less energy being consumed since optimum energy will be expended for transport of material; • Plan the works in a manner as to avoid reworking especially during meeting the interface requirements of systems Contractor; • Design site offices for maximum daylight and minimum heat gain. The rooms to be well insulated to enhance the efficiency of air conditioners; • Solar films to be used on windows where feasible; • Use and maintain equipment so as to conserve energy. 			
20.	Archaeological and Historic Resources	<ul style="list-style-type: none"> • If any Archaeological or historic resources is going to be affected by direct or indirect construction activity, special measures to be initiated with the notice of no objection of the Engineer; • Consult the Archaeological Survey of India (ASI) and other parties, on the advice of the Engineer, to identify and assess construction effects and seeks ways to avoid, minimize or mitigate adverse effects on such monuments; • If any historic structure appears to be affected, a resource protection plan to be developed in consultation with The Archaeological Survey of India (ASI); • The plan will identify the sensitive resources as well as specify the construction monitoring requirements. These requirements may include ground vibration monitoring and recording any components inadvertently subjected to impact; • Work to be stopped immediately if, during construction, an archaeological or burial site is discovered. The work will not recommence until approval of the Engineer is obtained for the same. 	Insignificant	Contractor	GC
21.	Fly Ash	<ul style="list-style-type: none"> • Fly ash to be used as a percentage substitution of cement, in concrete for certain structures and works as prescribed in the latest MoEFCC fly ash notification dated September 1999 and its subsequent amendments. The notification makes it mandatory for use of fly ash-based products in construction activities located within 300Km from coal or lignite based thermal power plants; • Only fly ash based products to be used for construction such as cement or concrete, fly ash bricks or blocks or tiles or clay fly ash bricks, block or tiles or cement fly ash bricks or bricks or blocks or similar products or a combination or aggregate of them; • A detailed record of usage of Fly Ash to be maintained. 	Insignificant	Contractor	GC
22.	Welfare measures for labour	<ul style="list-style-type: none"> • Latrine and urinals to be provided as per Chapter VI, Part – II of Rule 80 of Haryana BOCWR and also comply with the requirements of public health authorities; • When women are employed, separate latrine and urinals accommodation to be provided; • In case of moving sites like track laying, mobile toilets with proper facility to drain the sludge to be provided at reasonably accessible distance; • An adequate canteen conforming to Chapter VI, Part – II of Rule 81 of Haryana BOCWR to be provided at every workplace wherein not less than 250 workers are employed; 	Insignificant	Contractor	GC

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> • Sufficient supply of wholesome drinking water in every site as per Section 32 of BOCWA; • Quality of the drinking water shall conform to the requirements of national standards on Public Health Laws; • Drinking water facilities need to be easily accessible from the place of work for all workers at all locations of the Site. All such points to be legible marked “Drinking Water” in a language understood by most of the workmen employed; • Providing and maintaining a suitable room for use of children under age of 6 years in every workplace where in more than 50 female workers are ordinarily employed, conforming to the provisions of Section 35 of BOCWA; • Providing labour a suitable and safe accommodation free of charge, taking all necessary precautions to protect their health and welfare wherever labour are based some distance from their normal place of residence. The accommodation shall be in accordance to Section 34 of BOCWA; • All accommodation camps to be provided always with a sufficient supply of clean drinking water (of potable quality according to national legal standards), in suitable and easily accessible locations; • The quality of drinking water to be tested once a fortnight as prescribed in IS 10500:2012 and immediate remedial action to be taken if quality falls below the standard; • Providing all accommodation camps with clean and properly equipped and staffed kitchen and canteen facilities to supply meals for workers; • Providing sufficient toilet and bathroom facilities for the numbers of workers accommodated in each camp. Separate accommodation and toilet/bathroom facilities to be provided for men and women and all facilities to be kept in full working order always and cleaned and re-equipped daily; • Providing a laundry facility for the Workers at the Labour Accommodation Camps; 			
23.	Traffic Management	<ul style="list-style-type: none"> • Wherever operations undertaken are likely to interfere with public traffic, specific Traffic Management Plans to be drawn up and implemented in consultation with the approval of local Police Authorities and/or the concerned Politburo/Civil Authorities and followed to the IRC:SP;55- 2014 (Guidelines on Traffic Management in work zones) & IRC: 67 (Code of Practice for Road Signs); • The guiding principles to be adopted for safety in construction zone are to: <ol style="list-style-type: none"> a) Warn the road user clearly and sufficiently in advance; b) Provide safe and clearly marked lanes for guiding road users; c) Provide adequate traffic marshals to regulate the movement of traffic; d) Provide safe and clearly marked buffer and work zones; and e) Provide adequate measures that control driver behaviour through construction zones. 	Insignificant	Contractor	GC

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
24.	Grievances Redressal	<ul style="list-style-type: none"> • Constituting an appropriate Grievance Redressal Mechanism (GRM) for addressing grievances at worksite; • Grievances of workers to be first brought to the attention of supervisor at site. Grievances not redressed by the supervisor to be brought to the Grievance Redress Committee (GRC); • GRC to have representatives from workers, women representative, ESHS staff of the Contractor and ESHS staff of GC; • The main responsibilities of the GRC will be to : (i) provide support to workers on problems arising at worksite, (ii) record workers grievances, categorise, prioritize grievances and resolve them,(iii) immediately inform the Engineer of serious cases and (iv) report to workers on development regarding their grievances and decisions of GRC; • The panel of the GRC to function without any prejudice or fear of retaliation. 	Significant	Contractor	GC
25.	Noise and Vibrations to Tunnel Construction	<p>Noise</p> <ul style="list-style-type: none"> • Blasting activities to be so schedule as not to disturb local people and notify them prior to undertaking such activity. • Machinery and vehicles to be maintained regularly, with particular attention paid to silencers and mufflers, to keep construction noise levels to minimum. • Protection devices (ear plugs or ear muffs) to be provided to the workers while operating in the vicinity of high noise generating machines. • Operations to be scheduled to coincide with period when people would least likely to be affected. Blasting operation will be strictly prohibited in night. • Noise barriers will be erected at appropriate locations like the residential areas and sensitive areas like the schools which are adjacent to the Tunnel Project. • Charge mass per delay should be decreased by minimising the number of blastholes firing on each delay. • Smaller blasthole patterns and longer delays should be used between dependent charges. • Times of blasting shall be established to suit the situation and firing blasts when neighbours are busy with their daily tasks (and at a regular time such as lunch time). <p>Vibration</p> <ul style="list-style-type: none"> • A preconstruction survey of nearby structure likely to be adversely affected by the construction activities to be performed and threshold or limiting values to be established that take into account each structure's or use's ability to withstand the loads and displacements due to construction vibrations. • In addition, in advance of certain activities that are likely to result in vibrations, HRIDC and its contractors will conduct extensive outreach to those in the surrounding villages that could be affected 	Insignificant	Contractor	GC/HRIDC

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> • Drilling and Controlled Blasting will include a specification in construction contracts with regard to blasting operations requiring the contractor to implement a monitoring program and to protect nearby structures from damage, particularly if the structure is within the zone of influence. Vibration levels would be monitored in the foundations of nearby buildings during all blasting activities. Blasting activities resulting in peak particle velocity (vibration) levels in excess of appropriate damage criteria as measured in the foundations of nearby structures would be immediately stopped until further precautionary measures are taken to reduce blasting-related vibration impacts. • Work would not begin again until the steps proposed to stabilize and/or prevent further damage to the designated buildings are approved. • With implementation of the measures discussed above, vibration levels during construction would be reduced below the levels that would cause architectural or structural damage. However, vibration levels would still be at levels that are perceptible, and are likely to cause annoyance to residents adjacent to locations where significant construction operations are taking place (i.e., locations adjacent to where excavated material is being removed from tunnel and locations where tunnel construction operations takes place). HRIDC would not permit blasting in the night time as one means of mitigating such impacts. Moreover, throughout the construction period, HRIDC would maintain an extensive outreach system to advise the affected communities of construction impacts. 			
Operation Phase					
1.	Temporary land acquisition	<ul style="list-style-type: none"> • Borrow area redevelopment plan to be completed/enforced; • All temporary acquired land for construction of diversion, transportation of material etc should be redeveloped to the satisfaction of owner; • Affected productive area to be poured with top soil. 	Significant	Contractor	HRIDC
2.	Noise	<ul style="list-style-type: none"> • HORN PROHIBITED sign post to be enforced; • Maintenance of noise barriers if installed; • Discouraging local people from establishing sensitive receptors near the railway; • Public to be informed about the regulations on noise pollution; • Monitoring of noise pollution to be done regularly. <p>The monitoring cost of noise for 5 year operation plan considering 100 numbers of total samples with frequency of sampling twice a year, the estimated cost @ 1500 unit rate per sample is 1.5 Lacs.</p>	Significant	Contractor	HRIDC
3.	Soil erosion	<ul style="list-style-type: none"> • Embankment slopes to be re-vegetated, casualties to be replaced; • Residual spoils to be disposed properly. 	Significant	Contractor	HRIDC
4.	Vibration	<ul style="list-style-type: none"> • Maintenance procedures; • Location and design of special trackwork; • Vehicle modifications; • Changes in the track support system; • Building modifications; 	Significant	Contractor	HRIDC

S. No.	Environmental Impact	Mitigation Measure	Residual Impact after Mitigation Measure	Implementing Agency/Authority	Supervision and monitoring agency
		<ul style="list-style-type: none"> Adjustments to the vibration transmission path, and Operational changes. <p>The monitoring cost for vibration @ 100000 unit rates per sample for 5 year operation plan considering 10 numbers of samples, the estimated cost is 10 Lacs.</p>			
5.	Loss of trees and Avenue Planting	<ul style="list-style-type: none"> The avenue plantation to be completed, maintained and casualties to be replaced; Discouraging local peoples from cutting tree/branches for fuel, cattle food etc.; Educating people about the usefulness of trees. 	Significant	Contractor	HRIDC
6.	Biodiversity Management Plan	<ul style="list-style-type: none"> Identify the areas where biological invasions have occurred Habitat Improvement Programme Minimise Pollution Impacts Strengthening implementation of policy, legislation and administrative measure for Biodiversity management. 	Significant	Contractor/State Forest Department	HRIDC

10.11 SOCIAL MANAGEMENT PLAN

This section describes the SMP during different stages of project. The main aim of the SMP is to ensure that the various adverse social impacts are mitigated and the positive impacts are enhanced. The social mitigation measures have been incorporated at all the stages of the project right from Designing phase to Construction and Operational Phase. All care has been taken to provide mitigation measures for all expected social impacts at different stages. The SMP has been formulated for the proposed rail project for mitigation/management/avoidance of potential adverse impacts and the enhancement of the various social components along with overseeing/supervising responsibilities. The objectives of the SMP at various stages of the project planning and implementation can be summarized as follows:

1. To ensure compliance with lender's (AIIB) applicable safeguard policies, and regulatory requirements of Haryana State and the Government of India;
2. To formulate avoidance, mitigation and compensation measures for anticipated adverse social impacts during construction and operation, and ensure that socially acceptable, sustainable and good practices are adopted; and
3. To stipulate monitoring and institutional requirements for ensuring safeguard compliance.

A description of the various management measures during various stages of the project is provided in the **Table 10.7**.

Table 10.7: Social Impact Management Plan-Design, Construction and Operation

S. No.	Project related Social Issues	Management Measures	Frequency	Location	Implementation Agency/Authority	Supervision & Monitoring Agency
A. Social Management- Design Phase (Pre-Construction)						
1.	Land Acquisition affecting private plots, structures and households	<ol style="list-style-type: none"> Land will be acquired following the provisions of The Railways (Amendment) Act, 2008 and the compensation will be determined following India's new Land Acquisition and Rehabilitation and Resettlement Act, (RFCTLARR Act,2013). The land acquisition and compensation procedures are as per the Resettlement Policy Framework (RPF). The affected persons will be compensated and assisted as per the provisions given in Entitlement Matrix of RPF. <p>Resettlement and Rehabilitation activities will be governed by the general principles based on The Right to Fair Compensation and Transparency in Land Acquisition Act, 2013, Railway Circular No.E(NG)II/2010/RC-5/1 dated 11/11/2019 and Gazette Notification No.S.O.-3/C.A. 30/2013/S.30/2018 dated 23rd January 2018, Revenue and Disaster Management Department, Govt. of Haryana.</p>	Once	Corridor of Impact	District Administration-Competent Authorities for Land Acquisition (CALA)	State Government and Railway Board
2.	Gender Issues	<ol style="list-style-type: none"> Ensure that women's needs are equally met through Resettlement Action Plan. Ensure that compensation disbursement is transparent and compensation shall be in the name of both spouses. 	Once	Corridor of Impact	ESIA Consultant, HRIDC	GC/HRIDC
3.	Impacts on Local Economy, Livelihood	In order to ensure minimum negative impact and maximum positive impact on the local economy, it is important that the consultations and the grievance	Once	Corridor of Impact	ESIA Consultant, Contractor	GC/HRIDC

S. No.	Project related Social Issues	Management Measures	Frequency	Location	Implementation Agency/Authority	Supervision & Monitoring Agency
	Sources and Employment	mechanism within the scope of the RAP are properly operated.				
4.	Common Property Resources(CPR's)	<p>All commonproperty resources shall be relocated and restored before the commencement of the construction activity.</p> <p>While relocating CPRs(, all concerned agencies including HRIDC and GC shall take necessary precautions and shall provide barricades/delineation ofsuch sites to prevent accidents including accidental fall into boreholes, pits, drains both during demolition and construction/ relocation of such facilities.</p> <p>Standard safety practices shall be adopted for all such works.</p> <p>Access to the Common Property Resources (CPR's) shall be maintained.</p> <p>Relocation sites for all CPRs shall be selected in consultation with concerned communities, local administrative authorities/departments.</p> <p>The budget provision for the reconstruction / compensation of the CPRs is included in the RAP.</p>	Once	Corridor ofImpact	Contractor and Concerned Agencies	GC/HRIDC
5.	Relocation ofCultural and Religious Properties	All cultural properties within the CoI, whose structure is getting affected fully, shall be relocated at suitable locations, as desired by the community; and for partially impacted structures enhancement measures shall be applied at the same sites before construction begins, depending on the availabilityof space, the requirement of the communities and fund availability. No cultural properties or religious structures shall be removed or relocated without the knowledge andwritten consent of		Corridor ofImpact	Contractor, Concerned Community	GC/HRIDC

S. No.	Project related Social Issues	Management Measures	Frequency	Location	Implementation Agency/Authority	Supervision & Monitoring Agency
		<p>the concerned parties or communities and local administration as the case may be.</p> <p>Sites for the relocation of these religious structures shall be identified following the choice of the community. The budget provision for the reconstruction / compensation of Cultural and Religious Properties is included in the RAP</p>				
6.	COVID response	<ol style="list-style-type: none"> 1. Taking cognizance of situation at time of mobilization, the Contractor shall undertake a COVID 19 risk assessment of project area and prepare a COVID 19 Response and Management Plan (C-R&MP) and submit to the Engineer for approval. 2. The preparation of C-R&MP shall consider guidance of Government of India, World Health Organization, International Labour Organization, International Financial Corporation and World Bank's interim guidance note etc. Some of the key points on COVID Response and Management measures are given in Environment, Social, Health and Social (ESHS) Management Manual. 3. The contractor shall submit a weekly monitoring and progress report to the Engineer and HRIDC. 		All locations	Contractor	GC/HRIDC
7.	Possibility of gender-based violence (GBV) arising from influx of migrant labour	<p>A GBV risk mitigation plan shall be prepared to address GBV arising from influx of migrant labour. It shall comprise:</p> <ol style="list-style-type: none"> 1. Code of Conduct for signing by project workers (ESHS Management Manual) 2. Integrate GBV into existing IEC strategy/materials, GRM, safety talks, and regular meetings. 3. Community consultation and identification of GBV focal points within the community. 4. Training of labours on occupational health and safety issues. 	Once	Construction Workers Camps including areas in the immediate vicinity	ESIA Consultant, Contractor	GC/HRIDC

S. No.	Project related Social Issues	Management Measures	Frequency	Location	Implementation Agency/Authority	Supervision & Monitoring Agency
		5. Mapping of Service Providers for GBV prevention and response. 6. Identify Hot Spots for GBV within the project include construction work and labour camps alongside local communities, schools, liquor shops and migrant labourers residing in rented accommodations within the villages. 7. These areas need to be clearly identified and closely monitored throughout the project cycle.				
8.	Labour Requirements	1. The Contractor shall use unskilled labour drawn from local communities to avoid any additional stress on the existing facilities (medical services, power, water supply, etc.). 2. The recruitment of women and members of vulnerable groups shall be prioritized. 3. The Contractor shall provide training to build the skills of locally-recruited labour. 4. All staff, skilled and unskilled labour employed on a site shall be required to sign Codes of Conduct that shall ensure compliance with the Environmental, Social, Health and Safety provisions of civil works and consultancy contracts.		Along the project corridor at construction sites	Contractor	GC/HRIDC
B. Social Management-Construction Phase						
1.	Gender Issues	1. Proper illumination at work place and workers colony along with separate access to female/male toilets and waiting areas shall be ensured if women workforce deployed at site. 2. First aid medical facilities at the working sites for pregnant women and children. 3. It will be ensured that women workers are paid at par with male workers.	During Construction	Construction Workers Camps	Contractor	GC/HRIDC

S. No.	Project related Social Issues	Management Measures	Frequency	Location	Implementation Agency/Authority	Supervision & Monitoring Agency
		<p>4. Adherence to provision of labour law shall be ensured for civil contracts.</p> <p>5. If women workers are deployed at sites then day crèche facilities shall be provided to facilitate the women with infants working on site.</p> <p>6. A visible reporting desk is required at construction camp, work place.</p>				
2.	HIV/AIDS	The Contractor shall organize awareness programme for labourers on the risks of AIDs and STDs in coordination with Haryana State AIDS Control Society.	During Construction	Construction Workers Camps including areas in the immediate vicinity	Contractor	GC/HRIDC
3.	Risk of social conflict	<p>1. Provision of information regarding Worker Code of Conduct in local language(s).</p> <p>2. Workers will be required to sign a contract including the CoC.</p> <p>3. Provision of cultural sensitization training for migrant labours regarding engagement with local community.</p>	During Construction	Construction Workers Camps including areas in the immediate vicinity	Contractor	GC/HRIDC
4.	Child labour and school drop out	Ensuring that children and minors are not employed directly or indirectly on the project (Children are below 14 years and minor are below 18 years).	During Construction	Construction site	Contractor	GC/HRIDC
5.	Pressure on local infrastructure resources (temporary)	<p>1. Provision of services in the workers' camp to reduce the need for workers to use local community facilities.</p> <p>2. Avoid using and affecting local resources. Local water sources shall not be used for construction activities. Water shall be procured from outside or from the market. This is especially in water scarcity areas.</p> <p>3. The project shall aim and plan to have —zero impacts on local resources.</p>	During Construction	Construction Workers Camps including areas in the immediate vicinity	Contractor	GC/HRIDC

S. No.	Project related Social Issues	Management Measures	Frequency	Location	Implementation Agency/Authority	Supervision & Monitoring Agency
6.	Community liaison	<p>Contractor will provide a minimum of two (2) weeks notification to directly affected residents, businesses and other relevant groups of the intended construction commencement date.</p> <p>In providing a mechanism for communication between the contractor and the community and informing the public of construction details (timing, expected impacts), the concessionaire will undertake consultation and information activities</p>	During Construction	Construction Workers camps including areas in the immediate vicinity	Contractor	GC/HRIDC
C. Social Management-Operation Phase						
1.	Gender Issue	<ol style="list-style-type: none"> 1. Ensure that women, children and elderly people accessible facilities shall be provided at stations. 2. Provisions of separate queues for women for buying tickets. 3. Separate toilets for men and women at stations. 4. Patrolling of platforms during night hours by security personnel. 5. Ladies security personnel to be deployed for frisking women passengers. 	Continuous during operation	Station	Station Manager	HRIDC
2.	Elderly and Persons with disability (PWDs)	<ol style="list-style-type: none"> 1. Good illumination shall be ensured at stations to ensure the comfort of visually impaired. 2. Automated kiosks shall be accessible for wheelchair users and shall be clearly marked with international symbol accessibility. 3. Braille buttons and audio announcement system shall be ensured for persons with vision impairments. 4. It will be ensured that stations operations shall be easy to understand and operate for persons with disabilities and elderly persons. 5. Information's or Help Desk shall be close to the station entrance and highly visible upon entering the station. 	Continuous during operation	Station	Station Manager	HRIDC

S. No.	Project related Social Issues	Management Measures	Frequency	Location	Implementation Agency/Authority	Supervision & Monitoring Agency
		6. There should be clearly identifiable and accessible to wheelchairs at station.				

10.12 SOCIAL BUDGET

The cost estimate for private land is getting evaluated by HRIDC. Compensation for structures at replacement cost without depreciation was estimated as per latest BSR rates.

Table 10.8: Cost Estimate

S. No	Item	Input Unit	Quantity	Rate	Amount in Crore(Rs.)
1	Land Cost*	sq m			1124.235
2	Kutcha Structures and Solatium 100% (Titleholder)	sq m	1500	6,000	0.6
3	Semi-permanent Structures and Solatium 100% (Titleholder)	sq m	2700	10,000	1.485
4	Permanent Structures and Solatium 100% (Titleholder)	sq m	130000	16500	110.5
5	Borewell		73		2.22
6	Trees cost		6499		0.488
Sub Total					1239.528
Community Assets					
7	Temple- impact on boundary wall	Lump sump		4	0.05
8	Bhumiya	Lump sump		2	0.01
9	Ponds Rehabilitation	Lump sump		6	0.03
10	Tower	Lump sump		1	0.02
Sub Total					0.11
Grand Total Crores					1239.748
Source: Field Survey data by OMTC Team, June 2021					

*It includes the loss of standing crops

Source: DPR, HRIDC, January 2020

10.13 REPORTING SYSTEM

Environmental and social monitoring (ESM) is regular checking of the environmental and social management related issues detailed in the ESMP to ascertain whether the mitigation measures are achieving objectives as per the ESMP during construction and operational phase. Reporting system for proposed project ensures and provides all necessary feedback for the Project management Unit (PMU).

There will be General Consultant (GC) in the project. GC is already engaged by HRIDC. GC will supervise the environmental/social management at site. GC will be interface between Contractor and HRIDC. Contractor will submit monthly report to GC which will be checked for compliance for environment and social management plan at site including monitoring. A Monthly Progress Report and a Detailed Quarterly Report will be submitted by the GC to HRIDC. In addition to these, GC will submit to the HRIDC a semi-annual environmental and social monitoring report for the Project with all the stipulated details. This report will be forwarded by HRIDC to AIIB for further review.

Table 10.9: Reporting System During Construction and Operation Phase

S. No.	Particular	Contractor	General Consultant (GC) of HRIDC		HRIDC to oversee compliance monitoring
			Supervision	Reporting to HRIDC	
Construction Phase					
1	Monitoring of construction camp and construction site	Before start of construction work	Regular	Monthly	Regular
2	Environmental monitoring	As per Environmental monitoring Plan	As required	Monthly	Quarterly
3	Monitoring Enhancement sites	Implementation	Regular	Quarterly	Quarterly
4	Debris Disposal Area	Bimonthly	As required	Quarterly	Quarterly
5	Erosion control & topsoil preservation	Bimonthly	Bimonthly	Monthly	Quarterly
6	Tree cutting	Bimonthly	Bimonthly	Monthly	Quarterly
7	Tree transplantation /compensatory plantation	Monthly	Monthly	Monthly	Quarterly
Operation Phase					
1	Rehabilitation of Quarry site / debris disposal site / labor camps /construction camps / Project sites	One time	As required	As required	As required
2	Environmental monitoring	Quarterly	Quarterly	Quarterly	As per monitoring plan

10.14 RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

10.14.1 DISASTER MANAGEMENT

Disaster is a crisis that results in massive damage to life and property, uproots the physical and psychological fabric of the affected communities and outstrips the capacity of the local community to cope with situation. Disasters are those situations which cause acute distress to passengers, employees and outsiders and may even be caused by external factors. Disaster is an unexpected event due to sudden failure of the system, external threats, internal disturbances, earthquakes, fire and accidents.

Disaster: As per disaster management act, 2005 Chapter I, Preliminary, Section 2, (d) “disaster” means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.

Disaster Management- as per section 2, (e) of disaster management act, 2005. “Disaster management” means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for:

- i) Prevention of danger or threat of any disaster;
- ii) Mitigation or reduction of risk any disaster or its severity or consequences;
- iii) Capacity- building;
- iv) Preparedness to deal with any disaster;
- v) Prompt response to any threatening disaster situation or disaster;
- vi) Assessing the severity or magnitude of effects of any disaster;
- vii) Evacuation, rescue and relief;
- viii) Rehabilitation and reconstruction;

World Health Organization (WHO), defines disaster as “Any occurrence that causes damage, economic disruption, loss of human life and deterioration of health and services on a scale sufficient to warrant an extra ordinary response from outside the affected community of area”.

10.14.1.1 NEED FOR DISASTER MANAGEMENT

Disaster brings about sudden and immense misery to humanity and disruptions to normal human life in established social and economic patterns. It has the potential to cause large scale human suffering due to loss of life, loss of livelihood, damage to property, injury and hardship. HORC rail network system will carry thousands of passengers daily, therefore the effect of any disaster spread over in operational area (inside rail, railway stations or nearby areas of the rail alignment) is likely to be considerable. It may also cause destruction or damage to infrastructure, buildings and communication channels of rail network system.

10.14.1.2 TYPES OF DISASTERS CAUSING INTERRUPTION TO TRAIN SERVICES

Train specific disasters can be classified into two broad categories e.g.; Man-Made and Natural. The following disasters/accidents may be caused by human/equipment failure, which may affect normal movement of train services with loss of life or property or both.

a. Man- Made Disaster

- Terrorist attack
- Bomb threat/Bomb Blast
- Fire in train/at Station
- Setting fire to train/railway installations and railway property
- Placing of obstructions on track to cause disruption to traffic
- Tampering with railway fittings to cause accidents
- Release of Chemical or Biological Gas in trains
- Train accident and train Collision/derailment of a passenger carrying train
- Sabotage
- Stampede

b. Natural Disaster

- Earthquakes
- Floods

10.14.2 PURPOSE OF DISASTER MANAGEMENT PLAN

The purpose of the document is to provide step by step guidance to deal with any serious incident in the shortest possible time. Disaster Management mechanism in Railways can be maintained at a high level of preparedness and efficiency by keeping all resources readily available and in good condition. Resources imply both railway and non-railway men and material including medical personnel, transport, volunteers, police and fire services.

10.14.3 OBJECTIVES OF DISASTER MANAGEMENT PLAN

The main objectives of Disaster Management measures are as follows:

- Save life and alleviate the sufferings;
- Provide help to stranded passengers and arrange their prompt evacuation;
- Install a sense of security amongst all concerned by providing accurate information;
- Organize the site management in a most efficient manner;
- Protect rail property;
- Expedite restoration of train operation as early as possible;
- Lay down the actions required to be taken by staff in the event of a disaster in order to ensure prompt handling of crisis situation in a coordinated manner;
- To ensure that all officials who are responsible to deal with the situation are thoroughly conversant with their duties and responsibilities in advance. It is anticipation to avoid any kind of confusion and chaos at the time of the actual situation and to enable them to discharge their responsibilities with alertness and promptness.

10.14.4 PROVISION UNDER DISASTER MANAGEMENT ACT, 2005

The Disaster Management Act 2005 and the National Policy on Disaster Management lays down institutional mechanisms at the national, state, district and local levels. These mechanisms are expected to facilitate the paradigm shift in disaster management from relief-centric approach to a proactive regime that lays greater emphasis on preparedness, prevention and mitigation. These institutions are formed for installation of legal, financial and coordination mechanisms at the national, state, district and local levels.

10.14.4.1 The National Disaster Management Authority (NDMA)

Establishment of National Disaster Management Authority:

- I. With effect from such date as the Central Government may, by notification in the Official Gazette appoint in this behalf, there shall be established for the purposes of this Act (*The Disaster Management Act, 2005*), an authority to be known as the National Disaster Management Authority.
- II. The National Authority shall consist of the Chairperson and such number of other members, not exceeding nine, as may be prescribed by the Central Government and, unless the rules otherwise provide, the National Authority shall consist of the following:
 - a. The Prime Minister of India, who shall be the Chairperson of the National Authority, Ex officio;
 - b. Other members, not exceeding nine, to be nominated by the Chairperson of the National Authority.
- III. The Chairperson of the National Authority may designate one of the members nominated under clause (b) of sub-section (ii) to be the Vice-Chairperson of the National Authority.
- IV. The term of office and conditions of service of members of the National Authority shall be such as may be prescribed.

DM Act 2005

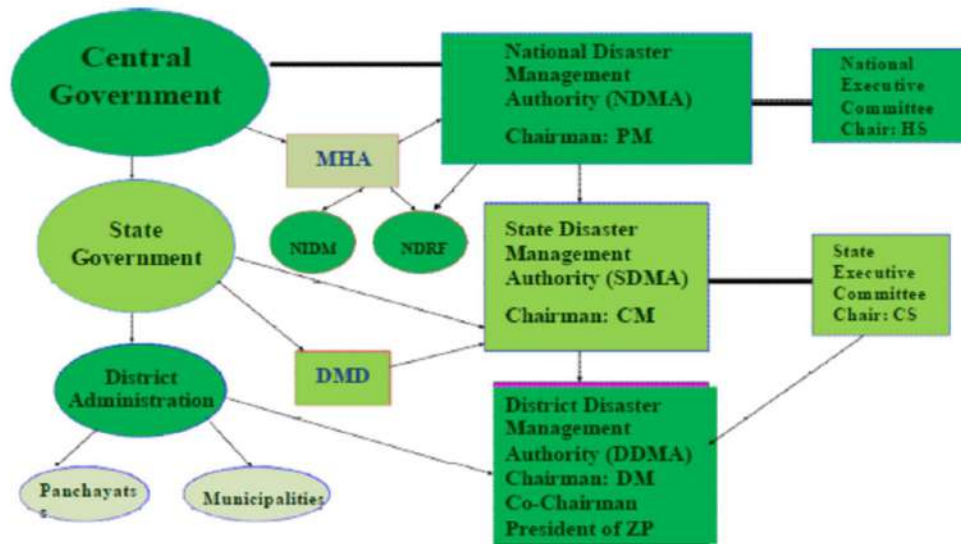


Figure 10.4: Legal Institutional Framework for Disaster Management, (Disaster Management Act, 2005)

10.14.4.2 State Disaster Management Authority

Establishment of State Disaster Management Authority:

- I. Every State Government shall, as soon as may be after the issue of the notification under sub-section (1) of section 3, by notification in the Official Gazette, establish a State Disaster Management Authority for the State with such name as may be specified in the notification of the State Government.

- II. A State Authority shall consist of the Chairperson and such number of other members, not exceeding nine, as may be prescribed by the State Government and, unless the rules otherwise provide, the State Authority shall consist of the following members, namely:
 - a. The Chief Minister of the State, who shall be Chairperson, ex officio;
 - b. Other members, not exceeding eight, to be nominated by Chairperson of State Authority;
 - c. The Chairperson of State Executive Committee, ex officio.
- III. The Chairperson of State Authority may designate one of the members nominated under clause (b) of sub-section (ii) to be the Vice- Chairperson of the State Authority.
- IV. The Chairperson of the State Executive Committee shall be Chief Executive Officer of the State Authority, the Chief Minister shall be the Chairperson of the Authority established under this section.
- V. The term of office and conditions of service of members of the State Authority shall be such as may be prescribed.

10.14.4.3 District Disaster Management Authority (DDMA)

Generally, each DDMA is headed by the Dy. Commissioner with the Chairman of Zila parishad as the Co-Chairperson. DDMA acts as the planning, coordinating, and implementing body for DM at District level and takes all necessary measures for the purposes of DM in accordance with the Guidelines laid down by the NDMA and HSDMA. It, inter alia, prepares the District DM plan for the district and monitors the implementation of the National Policy, the State Policy, the National Plan, the State Plan concerning its own District and prepares the District Plan. The DDMA also ensures that the Guidelines for prevention, mitigation, preparedness and response measures laid down by NDMA and HSDMA are followed by all Departments of the State Government, at the district level and the Local Authorities in the District.

Local Authorities

Local Authorities include Panchayati Raj Institutions (PRIs), Municipal Corporations, Municipalities, District and Cantonment Boards and Town Planning Authorities which control and manage civic services. These bodies prepare DM Plans in consonance with the Guidelines of NDMA, SDMA and DDMA and will ensure capacity building of their officers and employees for managing disasters, carry out relief, rehabilitation, and reconstruction activities in the affected areas.

10.14.5 COMMAND & CONTROL AT THE NATIONAL, STATE & DISTRICT LEVEL

The mechanism to deal with natural as well as manmade crisis already exists, and it has a four tier structure as stated below:

1. National Crisis Management Committee (NCMC) under chairmanship of Cabinet Secretary
2. Crisis Management Group (CMG) under chairmanship of Union Home Secretary.
3. State Level Committee under the chairmanship of Chief Secretary.
4. District Level Committee under the Chairmanship of District Collector.
5. All agencies of Government at National, State and district levels will function in accordance with guidelines and directions given by these committees.

10.14.6 Institutional Mechanisms in Haryana

(A) Haryana State Disaster Management Authority (HSDMA)

The HSDMA is the apex body for disaster management at State level and is headed by the Chief Minister. It lays down policies, plans and guidelines for disaster management and coordinates their enforcement and implementation for ensuring timely and effective response to disasters. It takes other measures which are considered necessary, for the prevention of disasters, mitigation, or preparedness and capacity building, for dealing with a threatening disaster situation. It oversees the provision and application of funds for mitigation and preparedness measures. HSDMA has the power to authorize the departments or authorities concerned, to make emergency procurement of provisions or materials for rescue and relief in a threatening disaster situation or disaster. The members of the HSDMA are mentioned in **Table 10.10**.

Table 10.10: Members of Haryana State Disaster Management Authority (HSDMA)

S. No.	Members	Designation of HSDMA
1.	Chief Ministry, Haryana	Chairperson, Ex-officio
2.	Finance Minister, Haryana	Member
3.	Health Minister, Haryana	Member
4.	Rural Development & Panchayats Minister, Haryana	Member
5.	Minster of state for Revenue	Member
6.	Chief Secretary Haryana	Member and Chief Executive Officer, Ex-officio
7.	Financial Commissioner, Revenue and Disaster Management, Haryana	Member
8.	Home Secretary, Haryana	Member
9.	Representative of National Disaster Management Authority	Member

(B) State Executive Committee (SEC)

State Executive Committee (SEC), Haryana assists the HSDMA in the performance of its functions. The SEC is headed by the Chief Secretary (CS) to the State Government and has four Ex-officio members, i.e. Financial Commissioner & Principal Secretary to Government, Haryana from four department's viz. Revenue & Disaster Management Department, Home Department, Finance Department and Health Department, Haryana. SEC coordinates and monitors the implementation of the National Policy, the National Plan and the State Plan. The SEC coordinates and monitors management of disasters in the state. It monitors the implementation of disaster management plans prepared by the departments of the Government of the State and District Authorities.

(C) Centre for Disaster Management– Haryana Institute of Public Administration (HIPA), Gurgaon

The Centre for Disaster Management, Haryana Institute of Public Administration, in partnership with NIDM and other research institutions has capacity development as one of its major responsibilities, along with training, research, documentation and development of a State level information base. It networks with other knowledge-based institutions and functions within the broad policies and guidelines laid down by the HSDMA. It organizes trainings for disaster management officials and other stakeholders.

10.14.7 Institutional Mechanisms at District Level

At District level following is the Institutional Mechanism:

(A) District Disaster Management Authority (DDMA)

It plans, coordinates and implements all measures for the purposes of Disaster Management in accordance with the Guidelines laid down by NDMA and HSDMA. It gives direction to departments at district level and local authorities to take measures for prevention or mitigation of disasters and also monitors that they implement disaster management plans at their respective level.

(B) District Disaster Management Committee

A committee to assist DDMA, in various aspects of preparedness and mitigation. Its major functions are reviewing the treat of disasters, assessing vulnerability to such disasters, evaluating the preparedness and formulating mitigation and response plans.

(C) District Crisis Group

The district crisis group is the apex body in the district to deal with major chemical and industrial accidents and to provide expert guidance for appropriately handling them. It prepares the District Offsite Emergency Plan and reviews the Onsite Emergency plans prepared by various respective Major Accident Hazard (MAH) installations.

(D) Control Rooms: Following control rooms are available at district level

- Disaster Management Helpline number
- Police Control Room
- Flood Control Room

(E) Incident Response System at District Level

The Incident Response System (IRS) at district level identifies and designates officers to perform various duties and get them trained in their respective roles; thus, reducing chaos and confusion during the response phase. It is a flexible system, and all the Sections, Branches and Units need not be activated at the same time. Various Sections, Branches and Units need to be activated only as and when they are required. It also includes proper documentation of various activities for better planning, accountability and analysis which also helps new/ outside responders to immediately get a comprehensive picture of the situation and go in for immediate action.

(F) Incident Response System at District Level

Disaster Management Plans (DDMP) defines role and responsibilities of the different Government departments, NGO's and general public for pre and post disaster management. Details of DMP of districts through which project passes is given in **Table 10.11**.

Table 10.11: Details of DMP of Districts through which HORC alignment passes

District	Name of Plan / document	Prepared by	Dated
Gurugram	District Disaster Management Plan, Gurugram	District Disaster Management Authority, Gurugram District, Haryana	2020
Jhajjar	District Disaster Management Plan	Haryana Institute of Public Administration & District Administration Jhajjar	2018
Nuh	District disaster management plan, Nuh	Haryana Institute of Public Administration, Gurgaon	2017-2018
Sonipat	District disaster management plan	Haryana Institute of Public Administration, Gurugram	2016-2017

Source: Various Govt. website

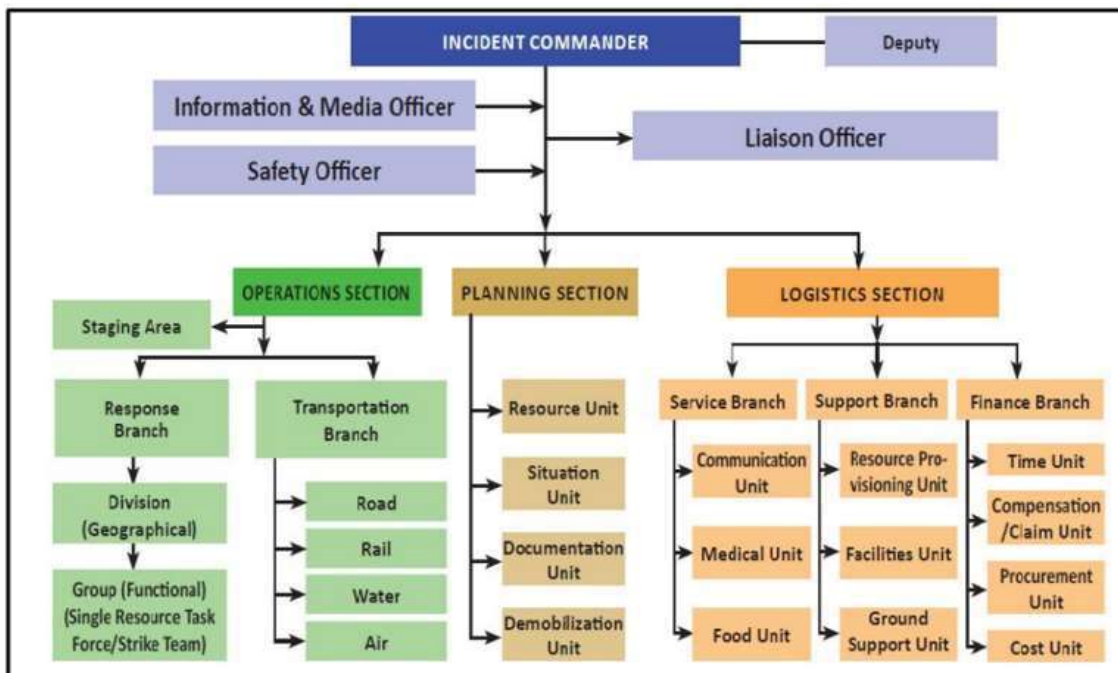


Figure 10.5 The Incident Response System (IRS) at District level

(G) Emergency Operation Centre (EOC)

The EOC under the control of Responsible officer is nerve center to monitor, Co-ordinate and implement the actions of disaster management. In a disaster situation the Responsible Officer is the central authority exercising emergency power to issue directives to all departments to provide Emergency Response services through IRS of District.

The Emergency Operation Centre is an offsite facility which will be functioning from the District Secretariat and which is actually an augmented control room having communication facilities and space to accommodate the various Emergency Support Function. It is a combination of all concerned line department of District Administration and other agencies whose services are generally required during incident response. The all concerned heads of the department and other agencies heads will be able to

take the decision on the spot under the guidance of Dy. Commissioner (RO) and will be able to assist the Dy. Commissioner (RO) in achieving the incident objectives. The Dy. Commissioner (RO) will also ensure that the line departments do not issue parallel and contradictory instructions to their field level officers.

The EOC will take stock of the emergency and assist the Dy. Commissioner (RO) in mobilizing the respective line department resources, manpower and expertise along with the appropriate delegated authorities for the on-scene IRT(s). The EOC will keep the Dy. Commissioner informed of the changing situation and support extended.

The DIO would be responsible for the maintenance and update all the facilities whereas EOC responsibility would be discharged most effectively only if it has required information through fail safe communication facility and an ideal information technology solution with decision support system (DSS). Web based technology solution will further help in assessing situational awareness, decision support and multi-agency coordination. It will also allow all collaborating agencies and departments inside and outside EOC environment to share information, make decision, activate plans and deploy IRTs, perform and log all necessary response and relief activities and make the EOC effective. The Dy. Commissioner of (RO) is responsible to the above capabilities in place.

10.14.8 Integrated Command System of Railways with Integrated Operations Centre of MHA

Indian Railway has an updated Disaster Management Plan, published in November 2019. In handling a crisis or a disaster, reliability of communication must be cent per cent. At the Divisional level, the control rooms have to communicate with the stations, the telephone exchange have to be functional, and the OFC and Quad cable network has to have reliable backups to be able to be effective. Where there is no back up of the Railways owned OFC network, an arrangement of sharing with Government/Non-Government organization and other service providers has to be planned in advance. Or else, the alternative of satellite communication be resorted to. However, the speed of reconnecting a failed communication by which ever means is of essence.

A traditional command structure exists in the Railway hierarchy which manages disasters in Indian Railways. Railways have their own extensive communication systems which would be used for Disaster Management of HORC project too. One of the strengths of the Railways to handle a disaster is its own communication network.

Traditionally the Control Room in each Division monitors on a “Real Time” basis the train operations. This Control Room is manned round the clock and has representatives of all the departments concerned with train operations as also with abnormalities which may affect train running. The “Command and Control” of the Divisions Control Room is with the operating department who plan, execute, and monitor the running of trains (both freight and coaching trains). Assistance of other departments, viz. Mechanical (Power), Electrical (Power and OHE Traction Distribution), Mechanical (Carriage and Wagon), Civil Engineering (track maintenance and monitoring), Commercial (passenger information interface), Signal and Telecom (through a ‘Test Room’), Security (RPF) etc is provided round the clock in the Operations Control Room. This control room of the affected divisions on the Railways will monitor the activities post Disaster and coordinates with the various organizations (rescue, relief, mitigation etc) in the disaster areas.

The Divisional control will coordinate with the “Zonal Control” where a similar control room exists, called the Emergency Control in the Headquarters of each Zonal Railway. “Zonal Control will establish liaison with the Disaster Management Centre in the Railway Board which in turn coordinate with the IOC of the MHA right from the stage of receipt and issue of “Orange or Red Alerts” and also for providing/requesting help in relief/rescue/mitigation to other departments (or State Government) or from them respectively. The Zonal Control will constantly update the position to Railway Board.

10.14.9 Standard Operating Procedures (SOPs) to be followed at the Time Of Disaster

- On occurrence of any disaster at any Station of, the Station Manager (on duty) shall immediately inform the Railway Control Room.
- Railway Control Room shall take two simultaneous actions: -
 - a. To activate the Disaster Management team of Indian Railway.
 - b. To inform, immediately, to State Disaster Control Room and Emergency Operation Centre (EOC) of concerned District.
- If more than one station situated in different districts are affected then O.C.C shall inform to the State Disaster Control Room besides informing to concerned districts.
- State Disaster Control Room Operator and District Disaster Control Room Operator shall immediately inform to the concerned departments as per District Disaster Management Plan.

10.14.10 Disaster Risk Management

Hazard is a threat or event which can cause damage; disaster is a major hazard event. Disaster risk is expressed as the likelihood of loss of life, injury or destruction and damage from a disaster. The recommended approach by United Nations office for Disaster Risk Reduction (UNISDR) is to manage disaster risk rather than managing disasters. Disaster risk is the combination of the severity and frequency of a hazard, the numbers of people and assets exposed to the hazard, and their vulnerability to damage. The main opportunity in reducing risk lies in reducing exposure and vulnerability. Disaster Risk Management includes the following actions:

- **Reduction and prevention:** Measures to reduce existing and avoid new disaster risks, for instance relocating exposed people and assets away from a hazard area. In case of mass transit like Railway such measures are not actionable.
- **Mitigation:** The lessening of the adverse impacts of hazards and related disasters. For instance implementing strict land use and building construction codes. This aspect is accounted for in design and construction of the project.
- **Transfer:** The process of formally or informally shifting the financial consequences of particular risks from one party to another, for instance by insurance.
- **Preparedness:** The knowledge and capacities of governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from the impacts of hazard events or conditions, for instance installing early warning systems, identifying evacuation routes and preparing emergency supplies.

Risk Management process comprises the following stages:

- a) Description of the system that is at risk
- b) Identify the potential hazards or sources of risk (the list of initiating events or scenarios of events leading to the undesired outcome – technological and human)
- c) Risk analysis to estimate the likelihood of the scenarios or events occurring and each scenario's consequence
- d) Compare and rank the various risk drivers
- e) Action plan in response to the identified major risks
- f) Regular monitoring, review and updating of the process.
- g) For example, the system at risk needs to be defined as to include inter-modal integration.
- h) Examples of potential hazards are fire risk or security alarms or failure of train control or motive power or passenger doors / escalators on trains or in stations; staff training and work environment; inadequate maintenance.

Risk Matrix for the project and activities during construction along with mitigation measures are given in **Table 8.9** and **Table 8.10** respectively

10.14.11 Emergency Management Plan

The purpose of this Emergency Management Plan is to provide details how the project proponent will prepare respond and recover from both onsite and offsite emergency situations. This EMP outlines the site specific management structure, resources, procedures and practices that will be implemented in the event of an emergency situation. The scope of works for this site will include, but not necessarily be limited to the provision of all labor, materials, plant, equipment, supervision and all other things necessary to perform the work. An EMP flow chart is given in **Figure 10.6**. It is the objective of emergency management to prevent the accidents and to minimize losses that occur due to such accidents by technical and organizational measures. It is also a responsibility of effective management to be able to restore normalcy as quickly as possible. In preparation of the EMP, the following elements have to be considered to make it effective.

- Prompt activation of Emergency Management Plan to minimize loss;
- Communication arrangements for warning/notification and requesting external help;
- Lighting and stand-by power for various combat operations;
- Setting up of an Emergency Control Center to act as a command and control point during an emergency;
- Defining escape routes and deciding upon methods that will be employed for evacuation of people;
- Provision for Medical care to the injured and response personnel;
- Protection of vital records;
- Formulation of public relations/functions including interaction with media, press, officials and neighboring population;
- Preparation and use of checklists for various emergency management functions for pre-, post and in emergency activities.
- Conducting regular training programs for all level of employees, and conducting Mock Drills for assessment of the level of preparedness of men and material at the site

In order to plan & managed impacts, four phases are designed for management of emergency so that most responsibilities and functions are performed during an emergency and accounts for activities before and after, as well as during emergency operations. Four phases of emergency management are as follows:

Preparedness Phase:- This phase involves emergency exercises/training, warning systems, emergency communication systems, evacuation plans, training and resource incentivization and development to improve the response capabilities to save lives and minimize disaster damage.

Response Phase: - This phase involves the actual provision of emergency services e.g., public warning, mobilization of emergency personnel/equipment, evacuation, search & rescue, emergency medical assistance, activation of emergency coordination centers during a crisis, emergency or disaster.

Recovery Phase: - Recovery operations continue until all systems return to normal or better. Recovery process may be short-term and long-term. Short-term operations involves e.g., temporary housing and food to restore vital services and provide basic needs. Long-term activities involves e.g., long-term medical care, disaster unemployment insurance, reconstruction of damaged areas, economic impact studies, etc.

Mitigation Phase: - This phase involves all the possible and suggestive activities which may eliminate or reduce the probability of reoccurrence of a disaster. Example establishment of building and fire codes, public education programs, vulnerability analysis updates, tax incentives or disincentives, zoning and land use management, building use regulations and safety zones, resource allocations, and preventive health care.

Table 10.12: Risk Matrix

S. No.	Family	Main Event	Short Description	Probability of occurrence	Proposed action
1	Geophysical	Earthquake	<ul style="list-style-type: none"> • Urban fires triggered by earthquakes; • Liquefaction - the transformation of (partially) water-saturated soil from a solid state to a liquid state caused by an earthquake. • Mass movement of earth materials, usually down slopes. • Surface displacement of earthen materials due to ground shaking triggered by earthquakes 	<p>The entire district falls in high risk seismic zone IV and corresponds to MSK intensity VIII.</p> <p>Earthquakes have been very frequent in Haryana.</p>	<ul style="list-style-type: none"> • Structures will be designed considering the seismic provisions as per Codal provisions. • Mock Drills. • Quick Evacuation of Site Workers and Staff • Contact to be maintained with nearest hospitals and Fire Stations for taking casualties for treatment and for rescue operations
2	Hydrological	Flood	<ul style="list-style-type: none"> • Heavy or excessive rainfall in a short period of time that produce immediate runoff, creating flooding conditions within minutes or a few hours during or after the rainfall. • The areas under low-lying contour zone (heterogeneous topography) and along the river of Yamuna are subject to flood hazard. There are number of instances when several districts faced flood hazard primarily due to heavy rain in monsoon and discharge in Yamuna. 	<p>Flood vulnerability of HORC alignment is less to moderate except from 91 km to 114 km where it is high as per climate risk analysis report prepared for the project.</p>	<ul style="list-style-type: none"> • Contact to be maintained with the regional office of IMD. • Early warnings to the project workers/staff to be given, when applicable. • Quick evacuation of Site Workers and staff.
3	During construction	Accidents	<ul style="list-style-type: none"> • Accidents during the construction of rail track, station, & Tunnel 	<p>Medium</p>	<ul style="list-style-type: none"> • Formulation of ESHS Policy and strict implementation of the same during construction phase. • Provision of safe system of work at worksites • Arrangements with nearest hospitals for emergency treatment in case of accidents. • Provision of first aid & Ambulances at the worksite

Table 10.13 Activities during Construction Along with Mitigation Measures

Hazards associated with activities	Control/Mitigation Measures
<p><u>Manual Handling</u> Strains and sprains - incorrect lifting - too heavy loads -twisting - bending - repetitive movement - body vibration.</p>	<ul style="list-style-type: none"> • Only trained person deployed for the work. • Manual handling technique to be adopted. • Good housekeeping should be maintained
<p><u>Falls - Slips – Trips</u> Falls on same level - falls to surfaces below - poor housekeeping - slippery surfaces, uneven surfaces - poor access to work areas -unloading materials into excavations wind - falling objects</p>	<p>Housekeeping - tidy workplace - guardrails, safety net, handholds, warning line and barriers, clear & safe access to work areas - egress from work areas and constant supervision of the worker from ground level.</p>
<p><u>Fire</u> Flammable liquids/Gases like LPG, Diesel Storage area and combustible building materials - poor housekeeping - grinding sparks - open flames, absence of Fire hydrant net work.</p>	<p>Combustible/flammable materials properly stored / used - good housekeeping - fire extinguishers made available & Fire hydrant Network as per approval - Emergency Plan in case of Fire or collapse of structure.</p>
<p><u>Absence of Personal Protective Equipment</u> Lack of adequate footwear, gloves -goggles - head protection -hearing / eye protection - respiratory protection.</p>	<p>Use of personal protective equipment and awareness training.</p>
<p><u>Defective or wrong Hand Tools /machines</u> Wrong tool - defective tool - struck by flying debris or missing safety devices over the equipment/machines strains and sprains - dust and carbon monoxide emission.</p>	<p>Right tool for the job - used properly - good condition/ using safety devices over the equipment and machines - eye/face protection.</p>
<p><u>Electricity</u> Electrocution - overhead/underground services - any leads damaged or poorly insulated - temporary repairs -no testing and tagging - circuits overloaded - nonuse of protective devices.</p>	<p>Leads good condition and earthed - no temporary repairs - no exposed wires - good insulation - no overloading - use of protective devices - testing and tagging -no overhead/ underground services</p>
<p><u>Scaffolding & Ladder</u> Poor foundation - lack of ladder access insufficient planking - lack of guardrails and toe boards - insufficient ties or other means - all scaffolds incorrectly braced or stabilized to prevent overturning. Carrying loads - not secured against dislodgement -defective ladders -insufficient length - wrong positions - incorrectly placed angles in access way.</p>	<p>All scaffolds correctly braced and stabilized - 4:1 height to base ratio - firm foundation, plumb and level - ladder access provided and used - proper platform (3 planks/675 mm) - planks secured - guardrails and toe boards. Secured against movement or footed - ladders in good condition - regularly inspected – sufficient length - use for access only, not working platforms.</p>
<p><u>Crane & Lifts</u> Display of carrying capacity i.e., load (no. of person), incorrectly slung, defective lifting equipment, unsecured loads, craning in close proximity to building people and plant - falls - falling materials.</p>	<p>Periodic testing by competent authority - correctly slung /secured loads, lifting equipment good condition - use of proper hand signals - falls while unloading controlled.</p>

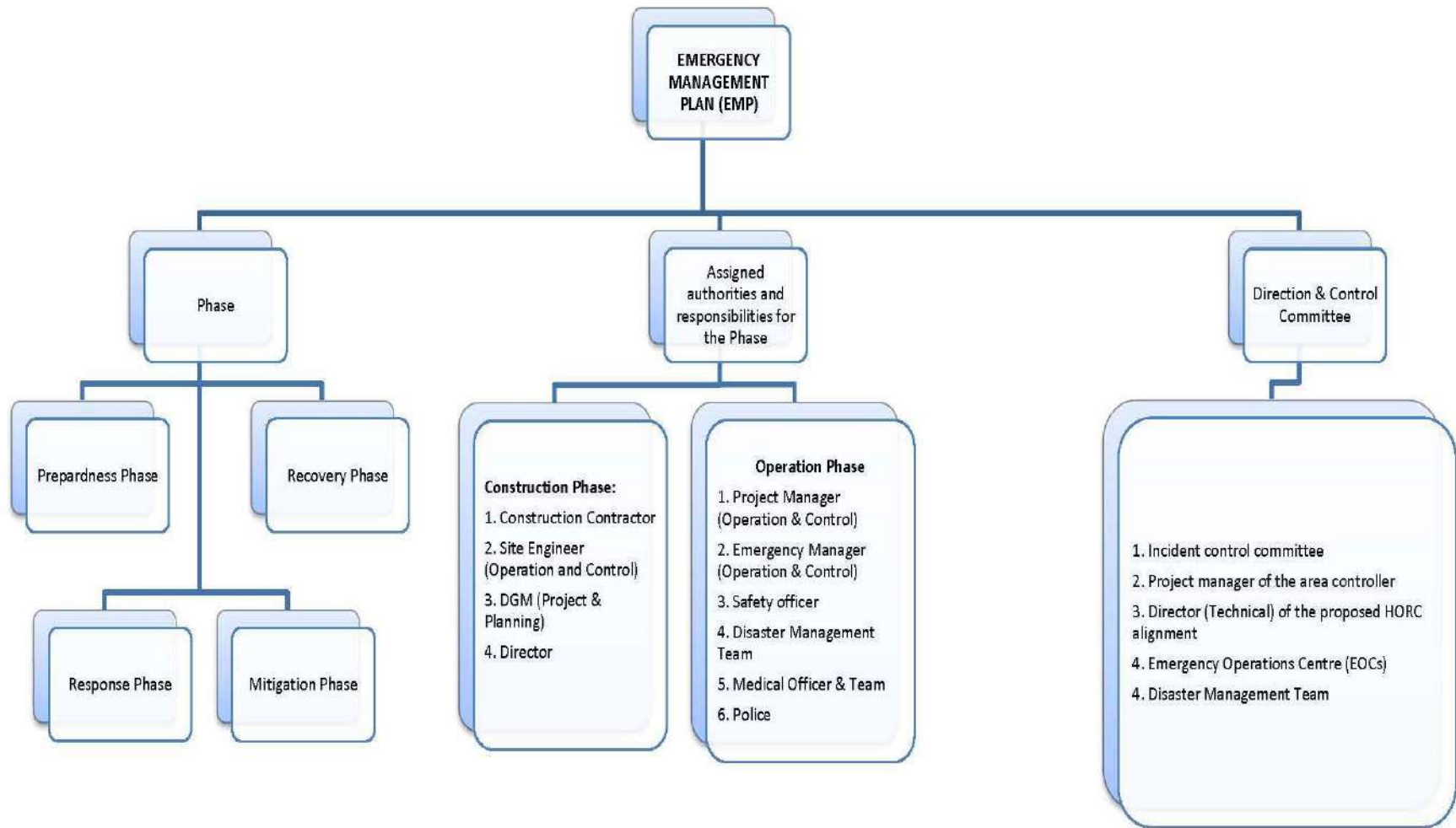


Figure 10.6: Schematic Flow Chart for Emergency Management

CHAPTER – 11 ANALYSIS OF ALTERNATIVES

11.1 BACKGROUND AND APPROACH

The final alignment of the proposed HORC project have been arrived at after taking into account environmental and social concerns, considerations of traffic, various construction methodologies (in case of Tunnel), integration with the existing system and importantly, the overall economic and financial viability. The underlying principles for evaluation of various alternatives, without affecting the overall usefulness of the corridor, are:

- Minimum private land acquisition,
- Least disturbance to properties,
- Minimum disturbance to people and
- Minimum disturbance to ecology/ biodiversity.

In the analysis of alternatives, a comparison of scenario with and without the project, location/alignment alternatives, technological alternatives (such as tunneling methods) have also been made.

11.2 With or without project

11.2.1 Option 1: No Development Alternative (Without Project)

In case HORC project is not constructed, the following will be impact on various environmental and social parameters:

- **Physical Environment:** In the ‘Without project’ Scenario, the capacity of timely movement of goods will remain constrained. This will create additional pressure on our already stressed roads. The traffic jams on highways and railways crossing will continue to deteriorate the noise levels and air quality due to idling of vehicles. Due to increasing the number of Vehicles in the study area, GHG emission will also increase.
- **Biological Environment:** In the ‘Without the project’ scenario, no direct impact is anticipated on biological environment (Flora and Fauna). However, in future due to increasing population and supply of goods the need of road transportation, and resultant widening of roads will lead to cutting of trees and loss of productive agriculture land.
- **Socio-Economic Environment:** Without the project, the agricultural produce may not move from field to marketplaces in a timely manner, which may result in loss of income to farmers in the area. In some time, the agricultural product is not able to reach the market in time due to increasing vehicles on the road. Public at large will continue to waste time in waiting at traffic jams triggered at railway crossings. The project of this size brings substantial investment, employment, and business opportunities, which in turn contribute improving the socio-economic condition of project districts. In absence of the project, the project area will be deprived of such above benefits.

11.2.2 Option - II (With Project)

As the proposed project is a green field railway project, the environmental status of the area will be better in comparison to other mode of transportations. Following positive changes will take place in the physical, biological and social environment in the area.

1) Physical Environment

With project scenario following positive changes are anticipated:

- The air quality and noise levels are likely to improve around the railway crossings due to provisions of ROBs at most of locations.
- Proposed project will immensely enhance the much-needed capacity for fast transport of goods from one end to another end of the country
- Will reduce the pressure on roads
- Air pollution and noise level are likely to increase during construction phase but that will be confined within the close vicinity of construction sites and will be temporary in nature
- There will be reduction of generation of GHG (Green House Gasses) and hence contributing in preventing global warming

The materials to be used in construction (ballast, sand, subgrade, steel and cement) will lead to permanent impact at quarry sites. The steel and cement usage will also have indirect impact on natural resources of the area. During operation phase there will be no requirement of these materials. Steel and cement will be procured from sources which produce steel in environmentally sound production units. Ballast, sand, subgrade will be obtained from sources where these are extracted through sustainable practices. Proper quarry/borrow area management practices will be adopted to minimize the long term and permanent impacts caused due to project.

Compensatory afforestation and tree plantation will be taken up by HRIDC and state forest department to mitigate trees loss due to proposed project.

The disposal of construction waste at identified location will not have any negative impact because only conventional and nonhazardous waste will be disposed-off at low productive and waste land/barren area. These materials will also be used for leveling the low-lying areas.

Minimum agriculture land will be acquired to minimize impacts on land use. Rehabilitation and resettlement plan have been prepared to avoid social impacts.

2) Biological Environment: In the ‘with project’ scenario, the overall impact of the project is likely to be medium on the biological environment except in terms of loss of trees which will be minimized and also regenerate over a period of time due to proposed compensatory tree plantation.

3) Socio-economic Environment: The ‘with project’ scenario will bring large investment to the project area and host of employment and business opportunities resulting in substantial improvement in the overall socio-economic conditions of the area. This will also ease the problem of traffic jams and long wait at railway crossings due to the construction of ROBs.

4) Apart from these, the proposed alignment will connect Palwal- Manesar- Patli- Farukhnagar- Jhajjar to make a Western Peripheral Rail corridor with Palwal to Sonipat bypassing Delhi. Due to this, the train traffic in Delhi region will be minimizing. After implementation of Kundli-Manesar-Palwal (KMP) expressway and the planning of Panchgram Urban centers, the Haryana Orbital Rail Corridor (HORC) project alignment from Palwal to Sonipat has been conceived on Techno-Economic consideration in the area.

11.3 CONCEPTUALISATION OF THE ALIGNMENT

The Haryana government will develop five new cities in the two km area on either side of the Kundli-Manesar-Palwal expressway and the area will be named as Panchagram. The Haryana Govt. approved the concept of the Panchagram Region and developing five cities on the Kundli-Manesar-Palwal (KMP) expressway on 50,000 hectares each side of the expressway which would cover eight districts of the State namely Sonipat, Rohtak, Jhajjar, Gurugram, Rewari, Mewat, Faridabad and Palwal. The Industrial and Commercial Townships were being set up on 3,300 acres area in Kharkhoda, Sonipat. Similarly, Industrial Model Township has been developed on 1,400 acres in Sohna of Gururgram. In view of this the alignment of the proposed HORC was conceived parallel to Kundli-Manesar-Palwal expressway of about 95 Km so that will boost to industrial Sector in the State. After Implementation of KMP Expressway and the planning of Panchgram Urban centres, the project alignment from Palwal to Sonipat has been conceived on Techno-Economic consideration. The alignment map is shown in **Figure 11.1**.

11.3.1 Design Alternative for the Project

The proposed HORC alignment has been modified at one location considering Technical, Environmental and Social concern i.e. from DPR Chainage 14000 to Chainage 29000 considering the following facts:

1. In between these chainages, HORC is proposed to cross Aravalli hill as well as DFC alignment.
2. DPR Tunnel alignment was passing under the habitat area of Sehsaula village.
3. The original DPR stage alignment was intersecting habitation at two locations i.e., at Chainage 24000 and 28000.
4. The DPR alignment was also crossing DFCC alignment with a skewed angle which was found not feasible as per site conditions.
5. The length of tunnel as per the DPR alignment was of approximately 4.8 km of length involving tunnel both in rock and soil.

After revising the alignment following improvements are achieved:

- a. Length of the tunnel has been reduced to 2.88km. It will reduce the cost, muck generation.
- b. Tunnelling under village has been avoided.
- c. The revised alignment is away from habitat area of Sehsaula village
- d. Acquisition of land/properties has been reduced (**Figure 11.2**).

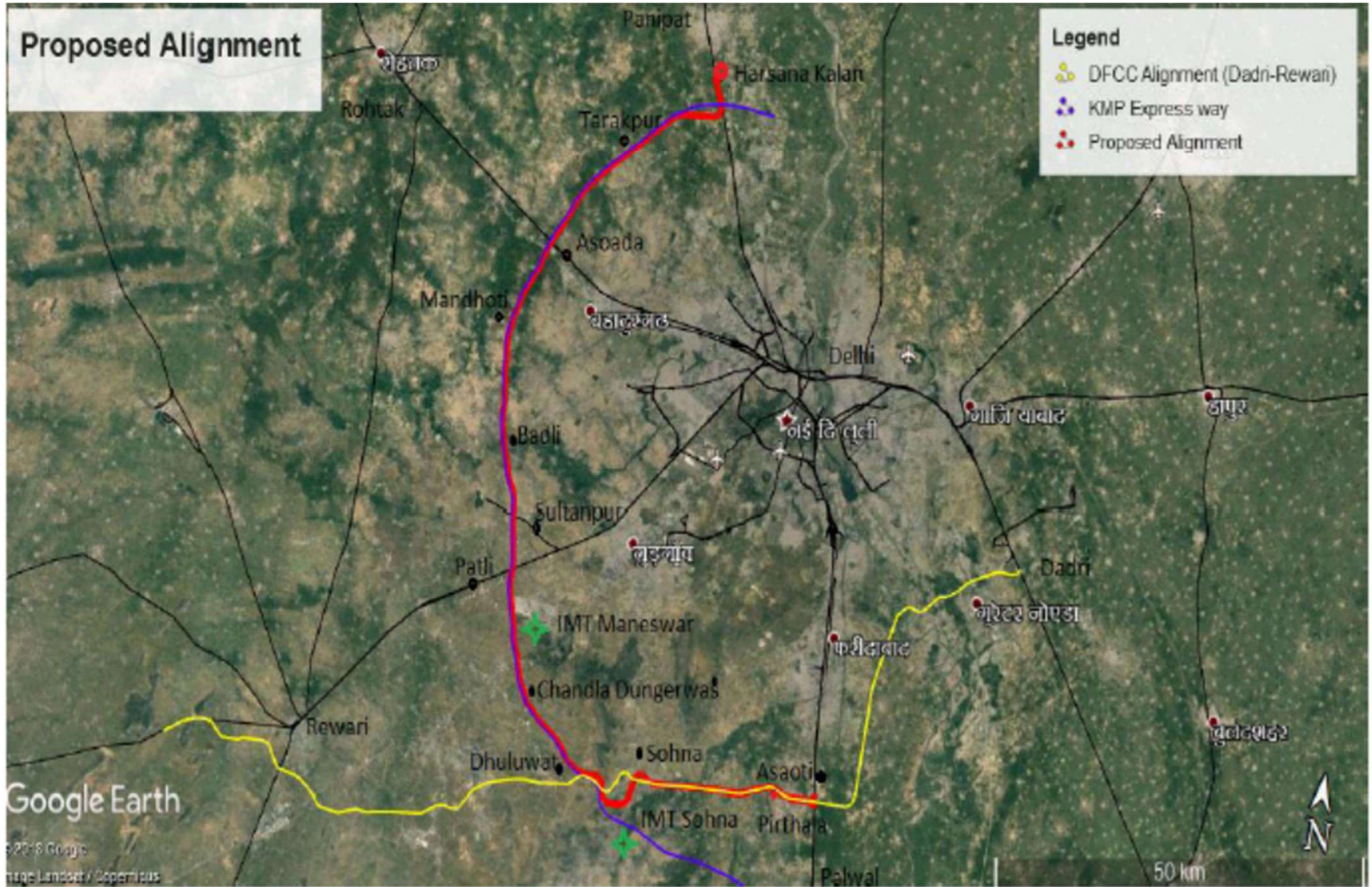


Figure 11.1: Alignment Map of HORC Project



Figure 11.2: Alternate Alignments between Chainage 14000 to Chainage 290 (Tunnel Location)

The comparison of these two alternatives is summarized and presented in **Table 11.1**.

Table 11.1: Comparison of Original Alignment and final Alignment

Item	Alternative 1	Alternative 2 (Revised)
Technical		
Length (km)	14	17 Comprehensive review of tunnel, viaduct has been done and total length of the section including tunnel is 17 km from Ch 15000 to Ch32000.
Underground/tunnel (km)	4.88	2.88 As per new alignment Tunnel length got reduced from 4.88km to 2.88km which will cause reduction in cost as well as time of construction.
Elevated (km)	0	3.54
At grade (km)	9.12	10.58
Land use pattern	Agriculture, residential and forest	Agriculture, and forest
Nature of Crossing with DFCC	HORC Tunnel is crossing below the DFCC.	DFCC has preferred to pass from P1 and P2 of Bridge No.87.
Environment		
Number of Trees	133*	40
Forest Area	Yes	Yes
Eco sensitive area if any	Nil	Nil
Sensitive receptors Like education institution, health, cremating ground, religious structure etc	Nil	Nil
Social		
No of affected villages	12	15
No of Habitat area	1	Nil
Total affected Structures	69	2
Total PAH	75*	84
Issue of resettlement	Severe	Mild
Number of displaced family	19	Nil
Source: HRIDC Nov 2021		

*Approximate

It is evident from the above that the two alternatives have some advantages and disadvantages in terms of cumulative impact-environment, social etc. On assessment of the advantages and disadvantages of these two alternatives and certain limitations, it is considered that Alternative 2 is the most preferred option.

11.4 ANALYSIS OF ALTERNATIVE TECHNOLOGIES

The project involves construction of 2.88 km tunnel from Chainage 24200m to 27080m. Various tunneling options have been compared. The list includes:

- Cut and cover,
- Drill and blast,
- Boring (using Tunnel Boring Machine (TBM)),
- NATM (sequential excavation – New Austrian Tunneling Method)

Cut and Cover Tunneling: Cut and cover tunneling is a common and well proven technique for construction shallow tunnels. The method can accommodate changes in tunnel width and non-uniform shapes and is often adopted in construction of stations. Several overlapping works are required to be carried out in using this tunneling method. Trench excavation, tunnel construction and soil covering of excavated tunnels are three major integral parts of the tunnelling method.

Most of these works are similar to other similar road construction except that the excavation levels involved are deeper. Bulk excavation is often undertaken under a rock deck to minimize traffic disruption as well as environmental impact in terms of dust and noise emissions and visual impacts.

Drill and Blast: This tunneling method involves the use of explosives. Drilling rigs are used to bore blast holes on the proposed tunnel surface to a designated depth for blasting. Explosives and timed detonators are then placed in the blast holes. Once blasting is carried out, waste rocks and soils are transported out of the tunnel before further blasting. Most tunneling construction in rock involves ground that is somewhere between two extreme conditions of hard rock and soft ground. Hence adequate structural support measures are required when adopting this method for tunneling. Compared with bored tunneling by Tunnel Boring Machine, blasting generally results in higher but lesser duration of vibration levels. A temporary magazine site is often needed for overnight storage of explosive.

Bored Tunneling: Bored tunneling by using a Tunnel Boring Machine (TBM) is often used for excavating long tunnels. An effective TBM method requires the selection of appropriate equipment for different rock mass and geological conditions. The TBM may be suitable for excavating tunnels which contain competent rocks that can provide adequate geological stability for boring a long section tunnel without structural support. However, extremely hard rock can cause significant wear of the TBM rock cutter and may slow down the progress of the tunneling works to the point where TBM becomes inefficient and uneconomical and may take longer time than the drill and blast tunneling method.

Sequential Excavation Method: This method is also known as New Austrian Tunneling Method (NATM). The excavation location of proposed tunnel is divided into segments first. The segments are then mined sequentially with supports. Some mining equipment's such as road headers and backhoes are commonly used for the tunnel excavation. The ground for excavation must be fully dry for applying the NATM and ground dewatering is also an essential process before the excavation. Another process relates to the ground modifications such as grouting, and ground freezing is also common with this method in order to stabilize the soil for tunneling. This method is relatively slow but is found useful in areas where existing structures such as sewer or subway could not be relocated.

11.4.1 Environmental Benefits and Dis-benefits of Various Tunneling Methods

Selection of the techniques to be adopted for construction of a tunnel section shall take into account the nature of the substrata and the levels of the tunnel involved. A summary of the environmental benefits and dis-benefits associated with the construction methods is presented in the **Table 11.2** below:

Table 11.2: Summary of Environmental Benefits and Dis-benefits of Various Tunneling Methods

Tunnel Construction Methods	Environmental Benefits and Dis-benefits (on relative terms)
Cut and cover tunneling	Dis-benefits: <ul style="list-style-type: none"> • More dust and noise impact may arise, though these can be mitigated through implementation of sufficient control measures; • Temporary decks are often installed before bulk excavation to minimize the associated environmental impacts; • Large quantity of C&D materials would be generated from the excavation works, requiring proper handling and disposal
Drill and blast	Benefits <ul style="list-style-type: none"> • Potential environmental impacts in terms of noise, dust and visual on sensitive receives are significantly reduced and are restricted to those located near the tunnel portal; • Compared with the cut and cover approach, quantity of C&D material generated would be much reduced; • Compared with the cut- and – cover approach, disturbance to local traffic and associated environmental impacts would be much reduced; • Blasting would significantly reduce the duration of vibration, though the vibration level would be higher compared with bored tunneling; Dis-benefits <ul style="list-style-type: none"> • Potential hazard associated with establishment of a temporary magazine site for overnight storage of explosive shall be addressed through avoiding populated areas in the site selection process.
Bored tunneling	Benefits: <ul style="list-style-type: none"> • Potential environmental impacts in terms of noise, dust and visual on sensitive receives are significantly reduced and are restricted to those located near the launching and retrieval shafts; • Compared with the cut-and-cover approach, disturbance to local traffic and associated environmental impacts would be much reduced; • Compared with the cut-and-cover approach, quantity of C&D materials generated would be much reduced;
Sequential Excavation Method	Benefits: <ul style="list-style-type: none"> • Similar to the drill-and-blast and bored tunneling methods, only localized potential environmental impacts would be generated Dis-benefits <ul style="list-style-type: none"> • As the method is relatively slow, duration of potential environmental impacts would be longer than that of the other methods.

On basis of technoeconomic, environmental and social feasibility, NATM with control blasting has been adopted in the project.

CHAPTER -12 SUMMARY & CONCLUSIONS

12.1 INTRODUCTION

The proposed railway corridor Palwal District to Sonipat District in the State of Haryana will facilitate the diversion of goods traffic not meant for Delhi region and also serve passenger trains which will directly connect region of Gurugram with capital of state *i.e.* Chandigarh, bypassing Delhi, leading to reduced journey travel time.

The proposed project is a greenfield project and alignment is mostly along the inner side (towards Delhi) of KMP expressway. The project envisaged laying of approximately 143.932 km rail line from Palwal to Sonipat with 17 Stations.

Apart from loss of land & structure, the proposed project will also provide benefit in terms of infrastructure development nearby to the railway alignment, easy transport communication from Palwal to Sonipat, etc. Overall, the proposed project will boost infrastructure development in the area along with economic development improving the life of people of the area by providing better accessibility through rail network to schools, colleges & business developments

12.2 KEY FINDINGS OF THE STUDY

The Environmental and Social Impacts (both positive and negative) of the proposed corridor is assessed in this report for project location, construction and operation. The major negative impacts are:

1. The proposed project stretch will involve acquisition of 765.734 ha of land, of which 530ha (69%) of private land and 236.734ha (31%) of government land.
2. Due to the project, 9889 PAHs of which 9885 PAHs are Title Holders and four PAHs are Non-Title Holders including one tenant and three kiosks are identified to be affected.
3. Out of this, 9871PAH's livelihood will be affected due to acquisition of agricultural land, 14 households loose their commercial structures and four non-Titleholders will relocate themselves. Out of the total PAHs,491 vulnerable households will be affected.
4. The project requires felling of 6499 trees and clearing of 21.4232 ha of forest.
5. Alignment is neither passing through any protected area nor any protected archaeological site is there along the alignment.
6. During construction temporary negative environmental impacts are; change of land use soil erosion, air pollution, noise and vibration pollution near construction sites, congestion near existing railway crossing, quality of soil and water, quarry and borrow area. During operation, negative impacts will be of noise, vibration, congestion at stations.
7. The project affects 371 structures including 19 residential,14 commercial, 73 Borewells /wells, 87 floor ramps, 44 chabutra, nine stairs and 122 boundary walls. Of these total affected structures, 18 are public amenities/community structures. Six ponds are required to be filled and these ponds are man-made surface water storage structures.

The benefits of the project are:

1. Employment opportunity of the order of approximately 720 workers during construction.
2. About 385 staff will be required for operation.
3. Congestion reduction on road; no increase from current ambient noise.
4. Decreased fuel consumption due to diversion of road traffic to railway.
5. Reduced air pollution of the order of 61100 (tCO₂/year) per annum due to shift of road traffic to rail.

Various measures to mitigate negative impacts have been recommended. Environment, social health and safety management plan covering these measures has been presented and cost of the same has been worked out. This project involves statutory approvals such as forest clearance and permissions from State Pollution Control Board.

Negative impacts have been mitigated by various measures. Cost of various environmental mitigation measures covering construction and operation phases, have been worked out as **INR 12.50 Crore**. The cost of Land, structures and CPR along with trees and crops impacted for the proposed HORC project is **INR 1239.748** crores.

12.3 RECOMMENDATIONS

A regular monitoring of the mitigation measures has to be ensured by Project Implementation Agency during construction phase of the project so that negative impacts can be avoided, if not avoidable can be reduced and if not shall be mitigated at site.

Annexures



186

हaryana रेल इन्फ्रास्ट्रक्चर डवलपमेंट कापारेशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक्रम)
Haryana Rail Infrastructure Development Corporation Ltd.
(A Joint Venture of Govt. of Haryana & Ministry of Railways)

Annexure 1.1

Dt. 17.11.2020

HRIDC/HORC-48/ES/2020/165

To,
M/s Overseas Min-Tech Consultants,
501, 5th Floor, Apex Tower, Tonk Road,
Jaipur-302015
Ph:-0141-2744509
Email: arun.omtc@gmail.com.

Sub: Letter of Acceptance :- To carry out Environment & Social Impact Assessment (ESIA) Study including preparation & submission of report in connection with Haryana Orbital Rail Corridor (HORC) project (143.93 Km) from Palwal to Sonipat including connections to the existing railway network.

Ref: i) E-Tender Notice No. HRIDC/HORC-48/ES/2020/01 Dt. 06.10.2020.
ii) Your Offer dated 02.11.2020

The competent authority for and on behalf of Haryana Rail Infrastructure Development Corporation has accepted your offer dated 02.11.2020 for sum of **Rs. 14,65,685 (Rupees Fourteen Lacs Sixty five thousand six hundred and eighty five only)** for the above subject work as per terms and conditions of the tender.

1. You are requested to start the work within 7 days of issue of LOA (Letter of acceptance) and the entire work shall be completed within 5 months from issue of LOA and time schedule will be regulated as per clause-6 of TOR. In this case D will be date of issue of LOA.
2. You are also requested to submit performance guarantee (PG) money for an amount of 5% of contract value i.e Rs 73,284 (Rupees Seventy Three Thousand Two Hundred and Eighty Four only) in this case as per clause 8 of General Condition of Contract mentioned in RFP.
3. You are requested to attend this office on or before **14.12.2020** for signing of the contract agreement (i.e. within 28 days of issue of this letter as per clause No. 8 of GCC).
4. You are requested to submit the Stamp paper of requisite value as per prevailing laws to execute contract agreement.
5. The earnest money deposited by you is converted into initial Retention money (Security Deposit). Balance retention money shall be deducted @10% from each running bills till the realization of full amount as per clause No. 8 of GCC.

Plot No.143, 5th floor RailTel tower, Sector-44, Gurugram, Haryana 122003
E-mail: horc.spv@gmail.com Website: www.hridc.co.in



185

हरियाणा रेल इन्फ्रास्ट्रक्चर डेवलपमेंट कॉर्पोरेशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक्रम)
Haryana Rail Infrastructure Development Corporation Ltd.
(A Joint Venture of Govt. of Haryana & Ministry of Railways)

6. You are requested to contact GM/P/HRIDC/Gurugram to commence the work immediately. The entire work shall be completed within a period of 5 months from the date of issue of letter of Acceptance i.e **17.11.2020** as per terms and conditions of contract.
7. This letter will constitute a legal and binding contract between Haryana Rail Infrastructure Development Corporation Ltd. (HRIDC) and M/s Overseas Min-Tech Consultants, till such time the contract agreement is signed.
8. All other terms and conditions contained in the agreement documents and Corrigendum shall form part and parcel of the contract.
9. The scope of work and terms of reference/technical specification is enclosed as Annexure-A.
10. No mobilization advance is payable for this contract.
11. Payment shall be made as per terms and conditions of the contract.
12. Payment shall be done as per clause-6 of TOR enclosed as Annexure-A.
13. LOA is sent to you both by email and by registered post to the address given in your quotation. You are requested to send one signed copy of this LOA as token of unconditional acceptance.
14. Before start of work you are requested to attend this office for collection of details as per clause 1.7 of TOR and submitting the detailed programme of work to be carried out.

For and on behalf of
Haryana Rail Infrastructure Development Corporation Ltd


(Pradeep Kumar)


GM/Projects/GGN

Encl. Annexure- 'A' (Terms of Reference)

184
Terms of Reference for Environment & Social Impact Assessment (ESIA) Study

1. GENERAL

- 1.1. The Haryana Rail Infrastructure Development Corporation Ltd (HRIDC) was incorporated in August 2017 as a State Joint Venture Company with 51% participation of the State of Haryana and 49% participation of the Ministry of Railways (MOR). HRIDC is mandated to design, develop, plan, construct, implement, operate and manage rail projects in the state of Haryana.
- 1.2. One of the projects being developed by HRIDC is Haryana Orbital Rail Corridor (HORC). It is a new electrified Double Broad-gauge (BG) rail line of around 121.742 route km from Palwal to Sonipat, via Sohna, Manesar, Kharkhoda bypassing the Delhi state. The project is proposed to have connections with the existing Indian Railway (IR) lines at Harsana Kalan, Asauda, Sultanpur, Patli and Palwal. The Project is also proposed to have connection with the Dedicated Freight Corridor at Pirthala. The total route length including connectivities to IR and Dedicated Freight Corridor network is around 144 km.
- 1.3. HORC is a part of Transport Infrastructure Corridor in Haryana National Capital Region (Master Plan approved by GoH). Under this corridor, Kundli-Manesar-Palwal expressway is already commissioned in November 2018. Approximately 80% project alignment is along the Kundli-Manesar-Palwal Expressway, where 50-meter wide Land corridor is already reserved in the Master Plan for Orbital Rail and 10% alignment is along the Western Dedicated Freight Corridor. A map indicating alignment of HORC is enclosed at Annexure-A.
- 1.4. The 'Haryana Orbital Rail Corridor' Project has already been notified as "Special Railway Project" by the Central Government vide Gazette Notification no. 499 dated 04.02.2020. Further, Competent Authorities (I. Sub-Divisional Officer (Civil), Palwal, II. Sub-Divisional Officer (Civil), Nuh and Tauru, III. Sub-Divisional Officer (Civil), Gurugram, Pataudi and Sohna, IV. Sub-Divisional Officer (Civil), Bahadurgarh (for entire Jhajjar district), V. District Revenue Officer, Sonipat) for land acquisition for HORC have been nominated by the Central Government Vide Gazette Notification no. 947 dated 13.03.2020. The process of land acquisition has already commenced. The work of preparation of land plans and land schedules by HRIDC is nearing completion. A Resettlement Action Plan (RAP) shall be prepared following the Railways Acts 1989, RFCTLARR 2013, and AIIB ESP and ESS 2 on Involuntary Resettlement.
- 1.5. An initial Environmental and Social Screening study for HORC project was conducted by an E&S consultant engaged by HRIDC in 2019. Copy of the same will be made available to the consultant for reference. It was a preliminary ESIA study covering following-
 - a. Scope of work for Environment Impact Study: Conduct Environment Screening Survey, Conduct Stakeholders Consultation, Collect Secondary Data on Environmental Parameters and support them with Primary Survey, Collection and Analysis of Data, Identification of Critical Environmental Issues, Identification of Applicable Statutory Clearances based on site visit and consultations, Preparation of IEE Check List for categorization of project
 - b. Scope of work for Social Impact Study -Data collection from primary sources, Social Survey of Potentially Project affected persons, Data collection from Secondary Sources, Conduct stake holder Consultation/ Focus Group discussion, Identification of critical Social Issues/hot spot, Preparation of Initial Social Screening Report and Check List, covering involuntary resettlement and Indigenous Peoples, if any.


DGM/civil

183

- 1.6. As an extension to the above mentioned study, a detailed updated Environmental and Social Impact Assessment (ESIA) study needs to be conducted, prepare a Resettlement Action Plan [and Livelihood Restoration Plan], and Stakeholder Engagement Plan (SEP) for the HORC Project incorporating and complying with the relevant national and local laws and regulations, and environment and social safeguard requirements of the Asian Infrastructure Investment Bank (AIIB), which is the funding agency for HORC Project, as provided in its Environment & Social Framework (ESF), comprising the Environment and Social Policy (ESP) and Environment and Social Standards (ESSs).
- 1.7. Details/Information to be provided by the employer:
 - a. KMZ file of Project Alignment shall be provided by the Employer (HRIDC).
 - b. A copy of Land Plans and Land Schedules prepared and submitted by HRIDC to competent authorities for LA shall be provided to the consultant. Other land documentations related to the land plots to be used by the project shall be sought directly by the consultant from concerned authorities.
 - c. A copy of Environment and Social Screening study conducted by HRIDC will be provided to the consultant. Relevant material may be referred only after independent verification/validation of the same by the consultant.
 - d. A copy of the detailed project report and related technical plans and profiles.
 - e. Other relevant documents (available with HRIDC) as may be requested.

2. OBJECTIVE OF ASSIGNMENT

A detailed ESIA study, including preparation of an Environmental and Social Management Plan (ESMP), a RAP, and a SEP needs to be conducted in order to mitigate potential adverse environmental and social impacts of the HORC Project. The specific objectives of the ESIA study are to:

- a. Identify and assess all relevant potential direct, indirect and cumulative environmental and social risks and impacts of the project i.e. HORC components and associated facilities (including but not limited to those identified in Environmental and Social Screening study) and recommend specific mitigation, management, and monitoring measures and plans to avoid, offset or minimize the impacts, and
- b. Formulate an implementable ESMP, RAP, and SEP integrating technically and economically feasible measures, timeframe, budget and capacity resources, and identifying the responsible entities to implement these measures, to avoid the identified impacts and an appropriate monitoring and supervision mechanism to ensure its implementation.

3. ABBREVIATIONS

(As per Annexure- D)

4. SCOPE OF SERVICES

4.1. Environmental Impact Assessment

The Railway projects are not listed in the Schedule (List of Projects and Activities requiring prior Environmental Clearance) of EIA Notifications. Therefore, prior environmental clearances from MoEF & CC is not required for proposed project.


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An Environmental and Social screening study (as mentioned in Section 1.5 above) was conducted earlier. The consultant shall review this Environment and Social Screening study report and use relevant data and information for carrying out further environment impact assessment study for preparation and submission of EIA Report containing mitigation measures and environment management & monitoring plan in a manner consistent with guidelines & policy of AIIB. Activities to be Performed for Carrying out EIA Study. Please refer to the AIIB ESF specifically ESS1 for the themes and elements of importance to the Bank and paragraph 28 for the specific contents of the report.

4.1.1. Preparation of Strip Map of the Alignment

Environmental sensitivity of the RoW shall be studied to identify the natural and man-made environmental sensitive features and strip plans should be prepared showing these sensitive features within RoW on GIS platform. Environmental sensitive receptors to be provided on strip plan shall include but will not be limited to following

- I. Notified Protected Areas/Environmentally sensitive/protected areas
- II. National Heritage Sites
- III. Critically Environmentally Polluted Areas listed by Central Pollution Control Board
- IV. Notified Areas by CGWB
- V. Archaeological Monuments
- VI. Monument/Places of Historical and cultural importance as notified by centre and state or as identified by the local community as important physical cultural resources.
- VII. Trees, plantation, orchards
- VIII. Land use
- IX. Whether the site or near surrounding have mangroves or is inhabited by RET species or is a place for migratory birds/mammals or is a spawning area for aquatic species.
- X. Community facilities that are sensitive to impacts of the railways (e.g. noise, vibration, increased foot traffic). These may include schools hospitals, places of worship etc.

4.1.2. Collection and Analysis of Baseline Data from the Study Area

This will include establishment of environmental sensitivity of project and developing an environmental base line with respect to the quality of existing environment in the study area. Maps showing the project alignment, identified environment sensitive receptors, environmental hotspots and detailed land use shall be prepared on the GIS platform. All the required documents from concerned authorities/departments shall be submitted in reference to the data mentioned above.

The consultant shall undertake primary surveys that shall include baseline monitoring of air, water, soil, noise and vibration at representative and sensitive locations, and identification of all macro-level environmental issues within the project's study area.

All surveys shall be carried out in compliance with the applicable standards/guidelines/norms. Wherever such guidelines/norms are not available, the techniques, tools and samples employed for the surveys shall conform to the International practices. Whenever directly relevant secondary data is available, these should be used, while indirectly relevant data should be verified through primary survey. Environmental quality (air, water, noise and vibration) monitoring shall include an adequate number of samples, as established on a sampling network to provide a representative picture of pollution levels along all the corridor. Additional data for sensitive environmental / ecological receptors, if any, shall be collected such as to analyse and predict the possible risks and impacts to a degree and precision of acceptable standards.


DGM civil

181

The surveys shall necessarily cover inventory of trees, streams/rivers, historical/cultural sites, construction material sources, settlements, land use, sensitive receptors etc. in project corridors, including preparation of tree cutting schedules and forest land diversion case. Further, additional specialized surveys, such as biodiversity assessment survey, and hydrological surveys shall be conducted, if and when required, as part of environmental baseline.

4.1.3. Impact Assessment

The following impacts are to be described; direct and indirect impacts, cumulative impacts and induced impacts. Impacts of concern would be those on the usual environmental impacts or air, water, soil, noise, vibrations etc. Included in this would be impacts on Biodiversity, Labor, Community Health, Environmental Health and Safety (workers and community), Physical and Cultural Resources (please refer to ESS1 of the AIIB Environmental and Social Framework). Wherever possible, describe impacts quantitatively, in terms of environmental costs and benefits. Quantification shall be done for water requirement, waste generation, muck generation, wastewater generation, requirement of waste and wastewater treatment, height of noise barriers required, safe distance for various land use from project site in terms of noise & vibration levels, etc. during both construction and operation phase. Borrow areas, if required shall be identified and marked on the map showing distance from the alignment and the route.

Please pay particular attention to Habitat Fragmentation impacts. This is important for linear infrastructure such as railways.

Based on baseline conditions and the planned project activities, Environmental impacts to be predicted by the standard methodology and applications of appropriate modelling e.g., prediction of noise and vibrations due to the proposed project activity etc. These projections would identify whether the pre-project critical environmental conditions would be further degraded. Residual impacts shall be calculated for each of the affected environmental attribute.

Environmental Enhancement: The consultant shall give special attention to the environmental enhancement measures in the project for the following:

- I. Cultural property enhancement along the alignment
- II. Landscape development along alignment
- III. Enhancement of water bodies along the alignment
- IV. Redevelopment of the borrow areas located on public land
- V. Adequate measures for environmental hotspots like fencing of the protected areas and accident-prone areas etc.
- VI. Study the fauna movement in detail and suggest measures to mitigate any disruption in fauna movement which may include establishment of fauna crossings, if required.
- VII. Other environment development activities

Consultant shall also perform climate risk and vulnerability assessment to assess the project's climate vulnerabilities and the associated risks to the structural component of the project. In consultation with project engineers the consultant will identify the adaptation measures and associated climate mitigation and adaptation costs. Climate risk assessment should also include estimation of greenhouse gas (GHG) emission reduction.


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Cumulative and Induced Impacts of the proposed project activities, and of the induced effects due to construction and operational activities of the project along with other actual or planned development activities in the project area. For this analysis, the Consultant will identify Valued Environmental Components (VEC) specifically relevant to the Cumulative Impact Assessment based on inputs from stakeholders and will assess the potential impacts of multiple development activities on the VECs.

The Consultant shall suggest on efficient use of environment friendly construction materials and technologies, energy and resource efficiency, water conservation and management, reduction of GHG emission and increasing carbon sink, climate resilient measures etc. The Consultant to the extent possible shall attaches economic values where feasible.

Basis of deciding Project alignment would be listed by the consultant. HRIDC will provide relevant documents to the consultant and the same shall be included as a part of this report.

4.2. Social Impact Assessment (SIA) and Resettlement Action Plan (RAP)

Social screening study (as mentioned in Section 1.5b above) was conducted by an approved E&S consultant. The consultant shall review the Social Screening study report and carry out further social impact assessment study, collect further data for preparation and submission of Social Impact Assessment (SIA) Report, Resettlement Action Plan (RAP) [and Livelihood Restoration Plan], Stakeholder Engagement Plan (SEP) Indigenous Peoples Plan containing mitigation measures and social management & monitoring plan in a manner consistent with guidelines & policy of AIIB. The consultant has to ensure compliance with all relevant national and local Acts/Laws and regulations and AIIB's ESP/ESF/ESSs for the purpose of this assignment. The consultant will list the relevant Acts and regulations and identify gaps with AIIB ESP/ESF/ESS and recommend measures on how these will be addressed. The consultant has to carry out the SIA and preparation of the RAP, and consider, but not limited to the following:-

- 4.2.1 Social Impact Assessment (SIA).** The social impact assessment (SIA) report will include (i) identified past, present and future potential social impacts, (ii) an inventory of displaced persons and their assets, (iii) an assessment of their income and livelihoods, and (iv) gender-disaggregated information pertaining to the economic and sociocultural conditions of displaced persons. The project's potential social impacts and risks will be assessed against the requirements presented in this document and applicable laws and regulations of the jurisdictions in which the project operates that pertain to involuntary resettlement matters, including host country obligations under international law. The social impact assessment will identify individuals and groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status. Where such individuals and groups are identified, propose and implement targeted measures so that adverse impacts do not fall disproportionately on them and they are not disadvantaged in relation to sharing the benefits and opportunities resulting from development. Tasks include, but not limited, to the following:
- (i) Study the project related documents (Feasibility Report or DPR as available, Social Screening Report, Land acquisition plan & schedule, relevant Acts (The Railways Act, 1989 & The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013), rules, Govt. orders, notifications, etc issued from time to time, and other documents related to the project area.
 - (ii) Undertake reconnaissance survey of the project stretch to understand social settings & issues, broad estimation of likely impacts (particularly physical displacement), common property resources, etc.


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- (iii) Develop survey tools (formats for Census and Socio-economic survey, guidelines for consultations, instructions etc) based on the understanding of the project, legal aspects, social issues, likely impacts, funding agency's requirements etc.
- (iv) Study AIIB's Environmental and Social Policy (ESP) & Environmental and Social Standards (ESS) to understand the AIIB's requirements.
- (v) Broadly specify the study area for assessment.
- (vi) Identify stakeholders to be consulted during the preparation stage and thereafter.
- (vii) Undertake video recording of the project corridor, in particular of places/locations where project impacts are likely to result in dismantling of buildings/structures and other immovable assets.
- (viii) The survey formats for conducting census and socio-economic survey (tab based or paper format) shall be approved by HRIDC, and reviewed by AIIB, before starting the survey.
- (ix) Conduct census survey: The census survey is aimed at collecting identification data, likely losses and other information to assess the magnitude and categorize of impacts for administering R&R entitlements. The Consultant shall undertake census survey by administering a questionnaire to all affected families covering landowners and others irrespective of ownership status (i.e. titleholders, encroachers, squatters, etc) in the project area. The survey will include recording of loss of assets (land, building by type of construction and present use, and other immovable assets and utilities), details of the person associated with the property affected [age, sex, education, social category (General, Other Backward Castes, Scheduled Castes, Scheduled Tribes); economic category (Below Poverty Line or Above Poverty Level), vulnerability, occupation, income, land holding, possibility of physical displacement, number of family members by gender, earning members by gender, resettlement and rehabilitation option, etc. The analysis of data collected through census survey will help establish the magnitude and categories of impacts. The questionnaire administered to the affected family shall take into consideration the gender aspects. The census survey format shall also take into consideration the information required for providing rehabilitation and resettlement assistance as per the Second Schedule of the RFCTLARR Act, 2013.
- (x) Use GPS enabled devices to record location of building/structure and also take photograph of affected building and other immovable assets. The required photographs (in soft copy) as above shall have GPS coordinates embedded in it. The measurement of buildings/structures shall be recorded by laser measuring tools or other suitable methods.
- (xi) Conduct socio-economic survey: It is aimed at collecting baseline socio-economic data from project affected families identified in the census survey for monitoring the R&R impacts and outcomes. The socio-economic survey will cover the project affected families/entities in the census survey [land owners (large, small, marginal), landless, BPL, owners of buildings/structures/businesses, encroachers, squatters, etc) of project affected families. The survey will contain but limited to: head of family, demographic profile of the family members, family size, social category, religion, literacy, present occupation, average monthly income, skill possessed, BPL/APL, access to basic amenities (water, sanitation, electricity), possession of consumer items, livestock resources, etc. Data to be collected shall be further expanded as required and will be analysed (disaggregated by gender wherever applicable and availability of data allows) and used for developing an Income/Livelihood Restoration Plan.
- (xii) As per Census of India, there is no Scheduled Tribe (ST) population in Haryana. However, the Consultant shall check and confirm that Scheduled Tribe (ST) population is not affected by the Project. In case ST is affected, the Consultant shall identify if the project impacts result in loss of land, livelihood, relocation, etc. Further, extent impacts on cultural heritage that is important to their identity (cultural, ceremonial, spiritual etc) shall be ascertained and consent obtained through free, prior and informed consultations.


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- (xiii) The social assessment shall also include project impacts on specific groups in the community, in particular on women and vulnerable groups, and shall provide for a gender and vulnerability analysis, by assessing baseline conditions of women and vulnerable groups in the community (i) socio-economic profile, (ii) problems and concerns particularly with respect to risks of sexual abuse and exploitation, trafficking, spread of communicable diseases, (iii) aspirations, and (iv) identify opportunities for participation and access to project benefits. The report should establish the further action plan required for the project planning and implementation and integrate the same in the Social Management Plan.
- (xiv) The SIA will also include safety concerns, child labour, compliance of labour laws in India (and Haryana), acceptable targets for employing women in construction activities and other possible benefits and mitigation measures, including corporate social responsibility initiatives, basic wages for skilled / unskilled workers, wage equality, child-care facilities of workers around the sites.
- (xv) The assessment will be carried out for social impacts during construction and operation phases. Social assessment should cover direct and indirect socio-economic impacts (local/non-local employment); effects on development in the area; changes in demographic conditions; additional demand for accommodation and local services as well as capacity to meet these demands; socio-cultural impacts (changes on quality of life, possible social problems, community stress and conflict). The socio-economic benefits of this project shall also be discussed. For construction phase, the focus of impact assessment will be on relocation of public utility, disturbance to traffic, restriction of access to community's facilities, lands and assets, etc., risk to community health and safety due to construction activities and influx of workers, risk of gender-based violence, sexual exploitation and abuse and labor issues. This phase also to include the design and construction of facilities that incorporates gender sensitive designs and those that enhances accessibility of Persons with Disabilities (PWDs) and persons with limited mobility.
- (xvi) For operation phase, in addition to the benefits, the emphasis of socio-economic impacts assessment shall be on restriction to local transport and risks to road safety, especially to the community.
- (xvii) Enumerate Common Property Resources (CPRs): Listing of common properties resources (like temple, mosque, bench, platform for sitting purpose, community centre, marriage hall, well, hand pumps, school, health facilities, etc) likely to be affected by the project shall be enumerated and photographed with GPS coordinates embedded in it.
- (xviii) Socio-economic profile of the project area: Collect comprehensive data and information from secondary sources on social setting and socio-economic conditions, employment, land use, livestock resources, community structure and various facilities (public health, education, market, bank, etc) for compiling socio-economic profile of the project area.
- (xix) Consultations with stakeholders: Meaningful consultations with various stakeholders shall be conducted in each district (covering individual PAP's, PRIs, local government departments, NGOs, associations, media, etc) who may have a role in the project implementation. Consultations in planning stage are aimed at promotion of public understanding and fruitful solutions of developmental problems and prospects of rehabilitation and resettlement. Mode of consultations will depend upon the type of stakeholders, number of participants, issues to be discussed, etc. The mode of consultations shall include individual discussion, spot consultations, Focus Group Discussions (FGDs), public consultations, workshops, etc. Consultations with women covering issues related to Gender Based Violence (GBV) and other issues specifically related to women shall be conducted by women member of the consultant keeping in view the tradition and culture of the project area. Consultations held shall be well documented with related photographs and videos (with due permission from participants for consultations with women) as per requirement of HRIDC/funding agency. Consultations shall also include a workshop to


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present the findings of the study to key stakeholders who directly or indirectly influence the Project. Formal stakeholder consultations shall be advertised by public notice in both English and appropriate local language(s). In this regard, prior intimation (at least 7 days) shall be given to the Employer (HRIDC) for proper communication, and participation of key stakeholders for effective feedback. The arrangement for stakeholders' consultation shall be made by the consultant as part of the consultancy services. This process will record and analyze people's perception on the project in terms of adverse & positive impacts, suggestions for minimizing involuntary resettlement, mitigation measures, livelihood restoration, etc. As part of this process, vulnerable group besides women shall be separately held to record their specific concerns and suggestions. The required photographs (in soft copy) as above should have GPS coordinates embedded in it.

4.2.2 Resettlement Action Plan

I. Land Audit of Land Acquired in the Past and Corrective Actions

The social compliance audit will focus mainly on the review and assessment of the completed land acquisition activities for approx. 98 hectares belonging to different government agencies (i) Haryana State Industrial and Infrastructure Development Corporation, Govt. of Haryana-70 hectares; (ii) Indian Railways, Govt. of India - 8 hectares; and Dedicated Freight Corridor of India Limited, Govt. of India- 19.7 hectares).

The Land Audit will assess whether the process of land acquisition has been done in compliance with the required laws, regulations, and standards and evaluate whether there are existing remaining legacy issues (complaints from former landowners, unpaid compensations, among others). Where non-compliance is identified, a corrective action plan (CAP) agreed by AIIB and the borrower/client will be prepared. The Plan will define the necessary remedial actions, the budget for such actions, and the time frame for resolution of noncompliance. Results of the land audit and CAP can be merged as one section in the RAP.

II. RAP for Land to be Acquired

The land acquisition for HORC shall be done as "Special Railway Project" under Railways Act, 1989. For the lands to be acquired for the Project, a RAP shall be prepared for the project to mitigate, compensate, resettle and rehabilitate the adverse social impacts caused by the proposed project. The RAP will be prepared as per the National Law/Policy, Railways Act 1989 (Amended 2008), RFCTLARR 2013, and AIIB ESP and ESS2 on Involuntary Resettlement. The RAP will include estimated budget for mitigation measures (compensation and rehabilitation & resettlement provisions, income/livelihood restoration plan), institutional arrangement for RAP implementation, grievance redressal, external monitoring, etc. Please refer to Annex C for the outline and coverage.

A participatory approach shall be adopted in the preparation of RAP wherein local communities will be involved in preparation of the resettlement action plan. The tools such as public consultations, focused group discussions, primary surveys, etc will be used. It shall cover the project footprint including associated facilities like approach road, flyovers, etc. RAP preparation shall include carrying out surveys (census & socio-economic survey, consultations, etc as detailed out below) to enumerate all properties and assets affected and persons associated therewith to understand the magnitude of project impacts and gather socio-economic baseline conditions in the project area: The socio-economic surveys shall be conducted among the affected households within the core areas/right of way. The assessment of the surrounding areas (outside of the core areas) will be mainly carried out through secondary data & reconnaissance survey with an evenly distributed sample size.


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4.2.3 Tribal Action Plan

A stand-alone Tribal Action Plan, if required will be prepared based on a review of SIA and Census findings in case the HORC project impacts the tribal communities, in line with the AIIB's ESP ESS3 Indigenous Peoples.

4.3. Grievance Redress Mechanism

The ESIA should present an appropriate grievance redress mechanism (GRM) in place to accept, manage, and resolve grievances related to environmental and social aspects of the project, both internally (labor) and externally (project affected people (PAP), community, stakeholders). It should be outlined with clear roles, timelines, procedures and responsibilities. It should also describe the options available to PAPs for grievance redress regarding environmental, social and resettlement issues. The ESIA shall indicate how the information of GRM would be disseminated and accessible in a way that is clear and comprehensible to the PAPs. The GRM should include provisions to protect complainants from retaliation and to remain anonymous, if requested. Reference should be made to the Project-affected People's Mechanism Policy of the AIIB. It is important to constitute field level Grievance Redress Committees (GRCs) which can be easily accessed by the community members.

The ESIA to also present an appropriate GRM for workers during construction and for operations phase.

The Consultant to also note that AIIB's Project-affected People's Mechanism (PPM) has been established by the Bank to provide an opportunity for the independent and impartial review of submissions from PAP who believe they have been or are likely to be adversely affected by the Bank's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through the Project-level GRMs or the processes of the Bank's Management. For information on the PPM, please visit: <https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>.

4.4. Stakeholder Consultation and Disclosure of Documents

Initially, a stakeholder analysis/mapping will need to be undertaken to identify key stakeholders of the project. The key stakeholders will be identified and their respective importance, influence, interests, and concerns/potential issues on the Project will be analyzed and presented in a matrix. A tentative list of stakeholders can be derived from the desk review and a reconnaissance survey of the proposed project sites. Once the list of key stakeholders is prepared, it should be confirmed through consultations with policy-makers, governmental representatives, local NGOs, elected local government representatives and officials. The sub-groups (age, gender, etc.) within each stakeholder group that face different constraints with respect to access, safety, affordability, availability, and health impacts and have different demands will also need to be identified.

Consultation process will be undertaken involving a range of tools including focus group discussions, one-to-one interviews, consultation workshops, and socio-economic survey, to achieve a meaningful consultation even at the face of COVID19 situation. Consultant shall undertake meaningful stakeholder consultation, including consultation with communities located along the alignment, NGOs/CSOs working in the area and those outside that may have interests, trade unions, other stakeholders, local bodies and relevant Government departments. If warranted, separate consultations will be conducted with women, youth, and other vulnerable groups. Special focus should be given to Persons with Disabilities and persons with limited mobility (elderly, pregnant women, children, etc) and identify their specific needs. Structured questionnaire shall be prepared and got approved from HRIDC before conducting the consultations for each group of the stakeholder identified. The


DGM civil

175

findings from the consultations should be taken into consideration in the design of the project whenever relevant.

A proper documentation of the stakeholder engagements and public consultation meetings shall be maintained as per guideline of AIIB including list of the participants along with the local representative like head of the villages (sarpanch), venue of the meetings, address, signature of the participants, proceedings of the works, photography as well as videography of the proceedings and all shall be submitted to HRIDC.

The consultant will provide support and assistance to the client in meeting the disclosure requirements, which at the minimum shall meet the guidelines of AIIB. Presentation and project information shall be disclosed at the appropriate level with prior permission from HRIDC.

In addition, a Stakeholder Engagement Plan will be prepared for implementation of the project.

4.5. Institutional Capacity Building & Training

Institutional assessment would assess: the current institutional structure of HRIDCL/HORC to deal with overall project and in particular the environmental and social aspects; current levels and modes of engagement with various stakeholders; availability and access to grievance redressal mechanisms for communities to seek redressal, etc. Based on this assessment, Consultant shall identify and recommend commensurate mitigation measures in the form of: in house capacity enhancement, external support in the form of general or project management consultants; contracting/hiring of environmental and social staff; training and capacity building measures, etc.

4.6. Risk Assessment and Disaster Management Plan

Risk Assessment and Disaster Management plan shall be prepared for the project. This plan shall identify all the risks related to the project design, implementation and operation phase. Plan should provide detail on identified risks and disasters, methodology to prevent these risks and disasters, preparedness plan for risks and disasters, institutional framework and resources requirement for implementation of risks and disasters.

4.7. Environmental and Social Management and Monitoring Plan

The environmental and social management plan and monitoring plan to include proposed mitigation measures, environment management plan, proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the plans including institutional framework.

Environment and social management plan shall also highlight the applicability of various rules and need of obtaining various permits specific to each of the project activity identified. The ESMP shall be made separately for design and pre-construction, construction and operation phases of the project. All the predicted impact and associated mitigation measures, estimated costs, and entities responsible for their implementation, should be provided in the ESMP along with the regular monitoring requirements for the key environmental performance indicator. ESMP shall also include detailed plans on plantation, transplantation, muck management, noise & vibration management, occupational health & safety management, labor and workers' camp management, waste management, muck management during both construction & operation phase of project etc.

To monitor implementation of ESMP, for different stage of project (pre-construction, construction, post construction), the Consultant shall identify the performance indicators, approach of monitoring, and frequency. The performance indicators should include both quantitative and qualitative types, but the Consultant shall consider practicality aspect and provide approach for monitoring each identified indicator.


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ESMP should also include implementation mechanism, schedule and associated costs for execution of mitigation and enhancement works; detailing of the requirements for institutional strengthening and training for project implementation, training requirements, record keeping, auditing & inspection requirement, review & updation of document. A detailed description with costs estimates of CSR (prepared on basis of need based assessment) should be incorporated in the EIA & ESMP reports. A standalone ESMP with the ESMP budget shall also be prepared. The suggested report structure (this is indicative, the consultant shall follow AIIB guidelines while preparing the report) is outlined in Annexure C.

The consultant will also provide inputs regarding various mitigation measures to be included in bid documents so that relevant portions of the ESMP are incorporated into the bid-document.

5. DELIVERABLE AND BRIEF DESCRIPTION OF THE STUDIES

A. Inception Report

S. No.	Deliverables	Brief Description of the Studies to be covered
1.	Draft Inception Report	Shall cover project description, summary review of project documents (Environmental and Social Screening, Feasibility Report or DPR as available, environmental inventory and survey plan and schedule, Land acquisition plan & schedule, applicable Acts, rules, Govt. (national and state) orders, notifications, AIIB's ESP & ESS, observations based on site visits, study area, critical locations in terms of environmental sensitivity, physical displacement, magnitude of physical displacement, impacts on common property resources, social issues, major constraints, draft survey formats an guidelines for conducting surveys and consultations in view of COVID-19 pandemic, identification of locations for environmental monitoring, identification of stakeholders, confirmation on presence of Scheduled Tribe population and need for further study, plan for next stage study, timeline, team composition, deliverables, etc.
2	Final Inception Report	Within 7 days from the date of receipt of comments from HRIDC.

B. Environmental Impact Assessment report

S. No.	Deliverables	Brief Description of the Studies to be covered
1.	Draft Environment Impact Assessment Report inclusive of Strip maps, environment management & monitoring plan (EMP & EMoP), Stakeholder Engagement Plan (SEP)	<p>I. Executive summary of the report, indicating key environmental impacts, mitigation measures, identification of key stakeholders, consultations and disclosures carried out.</p> <p>II. Site visit of the complete alignment and preparation of the strip maps showing the identified environmental sensitive receptors and hotspots within RoW identified during site visits</p> <p>III. Trees within RoW along with species, girth, height etc.</p>

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		<p>IV. Details of the affected environmental assets/properties due to project development, including cultural assets.</p> <p>V. Land Use map of RoW and study area</p> <p>VI. Ecological impact assessment and species wise conservation plan for identified RET species.</p> <p>VII. Noise and vibration analysis.</p> <p>VIII. Risk assessment & Disaster management plan</p> <p>IX. Consultations and GRM.</p> <p>X. Environmental and Social Management and Monitoring Plan</p> <p>XI. Stakeholder Engagement Plan- Authenticated translation of Executive Summary shall be provided in English and in Hindi.</p>
2.	Final Environment Impact Assessment Report inclusive of environment management & monitoring plan & Stakeholder Engagement Plan	<p>At the time of final submission, following standalone documents are required to be submitted:</p> <p>I. Environment Impact Assessment Report- Finalization of EIA report and Environment management & monitoring plan for proposed project, incorporating feedback received, if any, from the HRIDC, and stakeholders during the consultation process, and annexing all records of monitoring, survey and consultation (including records from initial scoping stage).</p> <p>II. Stakeholder Engagement Plan</p> <p>III. Standalone EMPs for inclusion in consultant bid document. Standalone EMPs are to be done according to the contract package to be decided by HRIDC. That is, if there will be one or several contracts/packages, the EMP should be drafted according and as applicable to those packages only.</p> <p>IV. Executive summary of the report (English, Hindi & Local language)</p> <p>V. Final Strip Maps showing environmental sensitive receptors within RoW</p> <p>The report will be considered final on compliance of all comments in the report including those from the AIIB.</p>
3.	Documents for Statutory Clearances	Documents for various clearance (applicable to project) as required and accepted by concerned authorities in line with the legislations of GoI including application forms, Performa, report, maps, studies etc.

C. Social Impact Assessment report

Sl.	Deliverables	Brief Description of the works to be covered
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1.	Draft SIA Report	<p>i. Description of the Project; Objectives & Methodology, Study area, Socially critical and sensitive areas, Policy and legal framework applicable to the Project, Project impacts and social risks, Risk assessment & Disaster management plan, Socio-economic profile of the project affected persons, socio-economic profile of the project area, Common property resources, stakeholder identification and consultation plan, public consultation and information disclosure, mitigation and monitoring measures, etc.</p> <p>ii. For more details refer section 4.2.1 above.</p>
2.	Final SIA Report	<ul style="list-style-type: none"> • Incorporation of comments/observations from HRIDC/ funding agency on the draft SIA report.
3.	Draft Resettlement Action Plan (RAP) inclusive of Livelihood Restoration Plan, SEP, Social Management Plan/Framework (SMP/SMF) & Resettlement Policy Framework	<ul style="list-style-type: none"> i Completion & Submission of Socio-Economic survey of affected PAH/PAP ii Completion and Submission of Stakeholder consultation details including Minutes, attendance, photographs, videography and suggestion at each village/tehsil/district level iii SMF shall be prepared as considering all social legislations stipulated by the Govt. of India, State Govt. and funding agency Safeguards Policies. iv Preparation of draft Social Management Plan/Framework (SMP/SMF) and a stand-alone Resettlement Policy Framework (RPF) for the overall project, along with plan for stakeholder/public consultations (For a comprehensive list of activities to be performed please refer Annexure-C) v. Preparation of draft RAP inclusive of SIA for proposed project, incorporating feedback received from HRIDC & AIIB, and stakeholders during the consultation process, and annexing all records of consultation (including records from initial scoping stage consultations). See outline in Annex C) <p>Authenticated translation of all required material such as "Executive Summary" etc. shall also be provided in Hindi.</p>
4.	Final RAP inclusive of, Livelihood Restoration Plan, SEP, Social Management Plan/Framework (SMP/SMF) & Resettlement Policy Framework	<ul style="list-style-type: none"> a) Compliance of observations of Employer/ funding agency on draft SIA/RAP b) Preparation of Micro Plan of each family/household (As per format approved by HRIDC) c) Preparation of Resettlement and Livelihood Restoration Requirements d) Final RAP incorporating the SIA after incorporating HRIDC and funding agency Comments. e) Comprehensive Grievance Redressal Mechanism including both Environmental & Social aspects f) Comprehensive Stakeholder Engagement plan including both Environmental & Social aspects g) Comprehensive Risk Assessment and Disaster Management Plan including both Environmental & Social


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	aspects, Comprehensive Institutional Capacity Building and Training plan including both Environmental & Social aspects The report will be considered final on compliance of all comments in the report.
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6. TIME SCHEDULE & PAYMENT SCHEDULE:

S. No.	Description of Deliverables	No. of Copies		Time Schedule (time from date of issue of LOA)	Payment to be released (% of Total Cost indicated in BOQ)
		Hard	Soft		
1.	Inception Report (ESIA)	3	1	2.0 Weeks	5%
A. Preparation of EIA Report & Environment Management Plan and Public Consultation					
2.	Draft Environment Impact Assessment Report inclusive of Strip maps, environment management & monitoring plan (EMP & EMoP), Stakeholder Engagement Plan (SEP)	3	1	1.0 Month	5%
3.	Final Environment Impact Assessment Report inclusive of environment management & monitoring plan & SEP	3	1	2.0 Month	5%
4.	Submission of all the necessary documents for obtaining applicable statutory clearances	3	1	2.5 Months	5%
5.	Final Acceptance of All EIA Reports and documents by AIIB	3	1	3.0 Months	15%
B. Preparation of SIA Report & Resettlement Action Plan					
6.	Draft SIA Report	3	1	3.0 months	5%
7.	Final SIA Report	3	1	3.5 months	5%
8.	Draft Rehabilitation Action Plan (RAP) inclusive of Social Management Plan/Framework (SMP/SMF) & Resettlement Policy Framework	3	1	4.0 Months	5%
9.	Final Rehabilitation Action Plan (RAP) inclusive of Social Management Plan/Framework (SMP/SMF) & Resettlement Policy Framework	3	1	4.5 Months	15%

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10. Final acceptance of comprehensive ESIA, ESMP, RAP, SEP and all reports/documents mentioned in this ToR in AIIB approved format.	3	1	5.0 Months	35%
			Total	100%

2. CONSULTANT TEAM QUALIFICATIONS AND COMPOSITION:

Team Composition with desired minimum qualification and experience as mentioned below.

S. No.	Key position	No of Positions	Minimum Qualification	Minimum Experience
1.	Team Leader	1	<p>a) Masters (Post-Graduate) degree or equivalent in technical subjects such as Social Welfare / Sociology/ Political Science/ Psychology/ Geography/ Anthropology/Economics/Environmental Science/ Environmental Engineering/Environmental Economics/ Urban Planning/Regional Planning/ Environmental Planning, Developmental Sciences Rural Development and Management - rural economics/ Economic Sociology/ Demographic Studies, Social Science and the like from a UGC /AICTE recognized university/ institution, Diplomas/Post Graduate Diploma conferred by institutions' like the Indian Institute of Social Welfare and Business Management (IISWBM), Institute of Rural Management; AICTE recognized institution with minimum 15 years of experience in large infrastructure projects/ similar assignments.</p> <p>b) Experience of minimum 10 nos. EIA/EMP/RAP/ SIA assignments which are accepted by the concern funding agencies in railway/ transport/ metro rail projects</p>	>=15 years
2.	Environment Specialist	1	<p>M.SC Environmental Science/ M.Tech Environment Engineering QCI/NABET Accredited Functional Area Experts SHW/WP/AQ/HG Experience of undertaking minimum 5 nos. EIA/EMP assignments in linear projects in Railways, Highways & Metro Rail sector (the reports should have been accepted by the Funding agency or</p>	>=10 years


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			MoEF&CC). Familiarity with MDB safeguards requirements.	
3.	Social Specialist	1	<p>a) Masters (Post-Graduate) degree or equivalent in technical subjects such as Social Welfare / Sociology/ Political Science/ Psychology/ Geography/ Anthropology/ Economics/Environmental Economics/ Urban Planning/Regional Planning/ Environmental Planning, Developmental Sciences Rural Development and Management - rural economics/ Economic Sociology/ Demographic Studies, Social Science and the like from a UGC /AICTE recognized university/ institution, Diplomas/Post Graduate Diploma conferred by institutions' like the Indian Institute of Social Welfare and Business Management (IISWBM), Institute of Rural Management; AICTE recognized institution with minimum 10 years of experience in large infrastructure projects/ similar assignments.</p> <p>b) Experience of minimum 5 nos. RAP/ SIA assignments which are accepted by the concern funding agencies in railway/ transport / metro rail projects</p> <p>c) Familiarity with MDB safeguards requirements.</p>	>=10 years
4.	Social Expert	1	<p>a) Bachelors in Sociology/ Social Work/ Economics/ Development Study or equivalent in technical subjects such as Social Welfare / Sociology/ Political Science/ Psychology/ Geography/ Anthropology/ Economics/ Urban Planning/Regional Planning, Developmental Sciences Rural Development and Management - rural economics/ Economic Sociology/ Demographic Studies, Social Science and the like from a UGC /AICTE recognized university/ institution, Diplomas/Post</p>	>=5 years

			<p>Graduate Diploma conferred by institutions' like the Institute of. Social Welfare and Business Management (USWBM), Institute of Rural Management; AICTE recognized institution with min 5 years of experience</p> <ul style="list-style-type: none">b) Experience of undertaking minimum 5 nos. SIA assignmentsc) Experience of undertaking survey, collection of record, conducting public consultations and data analysis etc.d) Familiarity with MDB safeguards requirements.	
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In addition to above, the consultant shall deploy adequate numbers of other experts/ surveyors to oversee the field work to be carried out by experienced personnel and do coordination with various stakeholders & Govt. departments to meet the project timeline. Consultant shall provide a detailed methodology/workplan with details of manpower deployment and CVs of all team members for approval by employer.


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Methodology for baseline data collection

The baseline data have been collected for all the following environmental settings in the following zone areas:-

- Core zone (i.e., the project area of 50 Mtr width throughout the alignment for Right of way)
- Project Influence area (0-500 Mtr)
- Buffer zone (500 Mtrs-5 Km on both side of corridor)
- Secondary data (0-10 Km Buffer)

1. Ambient Air Quality Monitoring

Measurements of air pollutants were carried out at project site and in neighboring areas by installing ambient air quality monitoring stations at predetermined locations selected during reconnaissance. The study period would be for maximum 1 season (not monsoon). Following parameters were monitored for ambient air quality:

- PM₁₀
- PM_{2.5}
- NO_x
- SO_x

These parameters were selected based on the guidelines given by the MoEF & CC and CPCB. The format for collection of ambient air quality baseline data is given in Annexure-Ia. The detailed monitoring methodology for ambient air is given in Table 1.

Table 1: Methodology of Ambient Air Monitoring

S. No.	Parameters	Test Method	Range	Instrument used	Model & Make of instrument
1	PM ₁₀	IS 5182 (Part-23) 2006, Gravimetric CPCB Guidelines for Ambient Air Monitoring	5 to 1000 µg/m ³	RDS (Respirable Dust Sampler)	APM 460BL (Envirotech)
2	PM _{2.5}	IS 5182 (Part-23) 2006, Gravimetric CPCB Guidelines for Ambient Air Monitoring	5 to 1000 µg/m ³	RDS (Respirable Dust Sampler) with attachment of PM _{2.5}	APM 460BL (Envirotech)
3	SO ₂	IS 5182 (Part-II) 2001, Reaff.2006	5 to 100 µg/m ³	Gas sampler	APM411 (Envirotech) AAS109 (Ecotech)
4	NO _x	IS 5182 (Part-VI) 2006	6.0 to 100 µg/m ³	Gas sampler	APM411 (Envirotech) AAS109 (Ecotech)

2. Ambient Noise Monitoring

Ambient noise refers to the sound energy content of the natural system including any sound produced due to anthropogenic activities. During assessment baseline study, preliminary survey was undertaken to identify the major noise generating sources in the area. The noise levels at different noise generating sources were measured based on the commercial and residential activities, traffic and noise at sensitive areas.

Noise level survey was conducted at the project site with an objective to establish the baseline noise levels and assess the impacts of the noise expected due to the proposed development. Instant Sound Level Meter (SLM) was used for the collection of data related to noise at an interval of one hour. The day noise levels were monitored during 6:00 AM to 10:00 PM and night noise levels during 10:00 PM to 6:00 AM at all the locations covered in the study area. Measured noise level displayed as a function of time provides a useful scheme for describing the acoustical climate of a community. Noise levels recorded at each station were computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels. The equivalent noise level is defined mathematically as:-

$$10 \text{ Log} \frac{1}{T} \sum (10L_n/10)$$

Where L = Sound pressure level a function of time dB (A)

T = Time interval of observations

3. Water Quality Monitoring

Water quality includes the physical, chemical and biological characteristics of water. An understanding of the various factors influencing water quality is thus very important as human health is largely dependent on the quality of water available for use.

Water quality analysis were carried out for major baseline parameters comprising of general parameters, organic matter, nutrients, major ions, other inorganics, toxic metals and microbiological. Temperature, pH, conductivity, DO and flow velocity were measured on-site. For other parameters, especially for biodegradable parameters, preservation methods were used. For more reliability of results, the time gap between collection from the site and testing at the laboratory was kept to a minimum. Samples were immediately transferred to the laboratory after preserving and storing them in dry ice during transportation. Preservation method is limited to pH control, chemical addition and refrigeration. The format for collection of water quality baseline data is given in Annexure-Ia. Test method for each parameter of water quality is given in Table 2.

Table 2: Parameter and test method used for water quality

S. No.	Parameters	Test Method
1.	pH value	APHA 22nd Edition, 4500- H-B
2.	Color	APHA 22nd Edition, 2120 B
3.	Turbidity	APHA 22nd Edition, 2130 B
4.	Odor	APHA 22nd Edition, 2150 B
5.	Taste	APHA 22nd Edition, 2160 B
6.	Total Hardness (as CaCO ₃)	APHA 22nd Edition, 2340 C
7.	Calcium (as Ca)	APHA 22nd Edition, 3500 Ca B
8.	Alkalinity (as Ca CO ₃)	APHA 22nd Edition, 2320 B
9.	Chloride (as Cl)	APHA 22nd Edition, 4500-CI-B
10.	Cyanide (as CN)	APHA 22nd Edition, 4500CN-D
11.	Magnesium (as Mg)	APHA 22nd Edition, 2340 B
12.	Total dissolve solid (TDS)	APHA 22nd Edition, 2540 C
13.	Sulphate (as SO ₄)	APHA 22nd Edition, 4500 E
14.	Fluoride (as F)	APHA 22nd Edition, 4500 – F- D
15.	Nitrate as NO ₃)	IS 3025 (P-34) 1988
16.	Iron (as Fe)	APHA 22nd Edition, 3500 – Fe- B
17.	Aluminum (as l)	APHA 22nd Edition, 3111 B

S. No.	Parameters	Test Method
18.	Boron (as B)	APHA 22nd Edition, 4500 B C
19.	Hexa Chromium (Cr + 6)	APHA 22nd Edition, 3111 B
20.	Phenolic Compound	APHA 22nd Edition, 5530 C
21.	Mineral Oil	Clause 6 of IS : 3025 (Part 39)
22.	Anionic surface Detergents (as MBAS)	APHA 22nd Edition, 5540 C
23.	Zinc (as Zn)	APHA 22nd Edition, 3111 B
24.	Copper (as Cu)	APHA 22nd Edition, 3111 B
25.	Manganese (as Mn)	APHA 22nd Edition, 3111 B
26.	Cadmium (as Cd)	APHA 22nd Edition, 3111 B
27.	Lead (as Pb)	APHA 22nd Edition, 3111 B
28.	Selenium (as Se)	APHA 22nd Edition, 3111 B
29.	Arsenic (as As)	APHA 22nd Edition, 3111 B
30.	Mercury (as Hg)	APHA 22nd Edition, 3111 B
31.	Total Coliform	IS 1622, 1981 (Reaffirmed 2003)
32.	E. Coli	IS 1622, 1981 (Reaffirmed 2003)

4. Soil Quality Monitoring

Soil may be defined as a thin layer of earth's crust which serves as a natural medium for the growth of plants. It is the unconsolidated mineral matter that has been subjected to and influenced by genetic and environmental factors, such as, parent material, climate, organism and physiochemical action of wind, water and sun light acting over a long period of time. Soil differs from the parent materials in the morphological, physical, chemical and biological properties. Also soils differ among themselves in some or all the properties depending on the differences in the genetic and environmental factors.

The study on the soil quality establishes the baseline characteristics and identifies the incremental concentrations if any. The soil characteristic include both physical and chemical details, the soil survey were carried out by the M/s Overseas Min- Tech Consultants, Jaipur to assess the soil characteristics of the area. The format for collection of soil quality baseline data is given in Annexure-Ia. Analysis method for each parameter of soil is given in Table 3. Standard soil classification as per ICAR guideline is given in Table 4.

The objectives of the sampling are:

- To determine the baseline soil characteristics.
- To monitor the impact on soil (pollutant deposition/other) in long run due to proposed activity.

Table 3: Analysis Methodology of Soil Samples

S. No.	Parameters	Test Method
1.	pH value	IS : 2720 (P-26, 1987)
2.	Conductivity	IS : 14767 – 2000 Reaffirmed 2006
3.	Soil Texture	USDA Method, 1968
4.	Color	USDA Method, 1968
5.	Water Holding Capacity	USDA Method, 1968
6.	Bulk Density	USDA Method, 1968
7.	Chloride as (Cl)	USDA Method, 1968
8.	Calcium(as Ca)	USDA Method, 1968

S. No.	Parameters	Test Method
9.	Sodium (as Na)	USDA Method, 1968
10.	Potassium (as K)	USDA Method, 1968
11.	Organic Matter	IS : 2720 (P-22, 1972)
12.	Magnesium (as Mg)	USDA Method, 1968
13.	Available Nitrogen (as N)	IS : 14684, 1999
14.	Available Phosphorus	USDA, APAH-4500 PC
15.	Zinc (as Zn)	APHA – 3030 D, APAH – 3111 B
16.	Manganese (as Mn)	APHA – 3030 D, APAH – 3111 B
17.	Chromium (Cr)	APHA – 3030 D, APAH – 3111 B
18.	Lead (as Pb)	APHA – 3030 D, APAH – 3111 B
19.	Cadmium (as Cd)	APHA – 3030 D, APAH – 3111 B
20.	Copper (as Cu)	APHA – 3030 D, APAH – 3111 B

Table 4: Standard Soil Classification

S. No.	Soil Test	Classification
1.	pH	<4.5 Extremely acidic 4.51- 5.00 Very strongly acidic 5.51-6.0 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2.	Salinity Electrical Conductivity (mmhos/cm) (1mmho/cm = 640 ppm)	Up to 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops
3.	Organic Carbon (%)	Up to 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4.	Nitrogen (Kg/ha)	Up to 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient
5.	Phosphorus (Kg/ha)	Up to 15 very less 16-30 less 31-50 medium, 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient
6.	Potassium (Kg/ha)	0 -120 very less 120-180 less 181-240 medium

S. No.	Soil Test	Classification
		241-300 average 301-360 better >360 more than sufficient

Source: ICAR (Indian Council for Agricultural Research)

5. Biological Environment

Objective of the study

The objectives of this study were as follows:

- To collect baseline data for the study along with a description of the existing terrestrial, wetland and aquatic vegetation.
- To assess species of conservation concern in the proposed site (Rare, endangered, critically endangered, vulnerable and endemic).
- To identify locations and features of ecological significance.
- To identify Impact of proposed project before, after and during development phase.

Methodology for Flora and Fauna Survey

a) Floral survey

The study on the floral assessment for the project activity was based on field survey of the area. Most of the plant species were recorded during the flowering/ fruiting stage so was easily identifiable. With the help of available flora/literature all the plant species were recorded and identified during the floristic survey at field stage.

- A detailed survey of the study area were made along the corridor for collection of baseline data on floral aspects. Roads side plantation, railway line plantation, agricultural area, barren area, forest area was covered in baseline data collection. In baseline data collection, inventory was prepared on Tree, Shrub, Herb, Climber, Sedge and Grasses with their local name, botanical name, family, habit.
- Quadrant Method: Frame quadrants, or often simply called quadrants, was used to define sample area within the study site (if possible). Plant species inside the quadrants were identified and their abundance estimated to work out the densities of various species. The locations of the quadrants chosen represent various vegetation types present within the study area and usually 10 nos. of quadrates were sampled to obtain more representative results. Three locations for tree species were selected for quadrat sampling survey.
- Besides the collection of plant species, information was collected with vernacular names of plant species made by local inhabitants. In this process, the whole study area were divided into different sections to get the maximum diversity of plant species. The sampling sites was selected based on land use pattern, topography and floristic composition of the study area.
- The other relevant information on bio-diversity, like economically important plant species and medicinal plant, information related to rare and endangered species in the study area was collected from secondary sources like forest and wild life departments.

(b) Faunal and Avifaunal survey

All the faunal species recorded during the survey were identified at field stage with the help of available literature.

- Identification and documentation of Avian, Reptilian, Amphibian, Mammal and other faunal diversity.
- Observations by direct and indirect evidences, trails. (Sighting during ecological studies, pugmarks, fecal material present on bern of path, urine marks, landering, dropping below huge trees.)
- Identification of birds by recording voice of the birds during day and night. Study of habitats of the birds (old wells, old closed houses, old trees trunks, etc.)
- Analysis of Scheduled species.
- Study of Habitat/microhabitat for the faunal elements in the project site and surrounding areas within 2 km range from the route.
- Records of the forest department and discussion with forest officials.
- The presence of wildlife was also confirmed from the local inhabitants depending on the animal sightings and the frequency of their visits in the project area.
- In addition review of secondary data was another source of information for studying the fauna in the area.

CENSUS SURVEY QUESTIONNAIRE

Respondent should be Head of household or any adult member of the household

Questionnaire No:	
(To be conducted for all households affected (directly or associated) with land/ structures and other assets that may be affected by the project)	

1.0 General

1.1	House hold Name		1.2	Km/Chainage	
1.3	Place/Location/ Village		1.4	Tehsil	
1.5	District		1.6	Survey Date	
1.7	Surveyor Name		1.8	Surveyor Code	
1.9	Khasra No.				

2.0 Property/asset (Land, structure, others) to be affected –multiple choice possible

2.1	Land		2.2	Structure (Shop)	
2.3	Structure (House)		2.4	Crops (specify)	
2.5	Others (specify...)		2.6	Trees	

3.0 Ownership of property/asset affected

3.1	Private property (TH)		3.5	Panchayat/ Gram Sabha	
3.2	Assigned land (Patta land)		3.6	Institution/ Trust/ Society/ etc	
3.3	Govt. land		3.7	Encroacher	
3.4	Pvt. Ltd. Company		3.8	Squatter	
3.9	Other (specify)				

4.0 Details of property/ asset affected

4.1	Village/ Hadbast (Map No.)								
4.2	Survey/Khasra No. of land plot affected								
4.3	Land area to be acquired as per LAP (in Acre)								
4.4	Total area of the land as per land record (in Acre)								
4.5	Type of land: Irrigated-1; Non-Irrigated- 2; Barren - 3; Forest- 4; Other (specify)- 5								
4.6	Present use of land: Agriculture/Cultivation-1, Residential-2, Commercial -3, Residential-cum-commercial -4, Orchard- 5, Plantation – 6, Forest -7, Other(specify)-8								
4.7	No. of structures impacted on affected land plot								
4.7.1	Type of structures affected (Details to be filled in IOL format)	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8

4.7.2	I.	Structure Name* (indicate specific name /use)										
	II.	Distance of structure from centre of railway (m)										
	III.	Distance of the boundary wall (if any) from the center line (m)										
	IV.	Area of the affected structure (excluding the boundary wall)- in square meter Indicate length, width, height (m)	L= W= H=	L= W= H=	L= W= H=	L= W= H=	L= W= H=	L= W= H=	L= W= H=	L= W= H=	L= W= H=	L= W= H=
	V.	Scale of impact on the structure- estimate in %										
	VI.	Type of construction of the structure- Temporary -buildings with mud/brick/ wood walls, tin roof. Semi-permanent-buildings with tile roof and cement floor, Permanent - with RCC, 1/2/3 storey?)										
	VII.	Type of construction of the boundary wall (brick, stone, concrete, mud/wood)										
	VIII.	Age of structures/when structures are constructed (yr)										
	IX.	Market value of structures (Rs)										
	X.	Status of structure- Legal title Holder, customary right, license from local authority, encroacher, squatter, others										
		XI.	Any of the following people associated with the structure: A. Tenant (provide names & contacts) B. Employee/wage earner in commercial structures (provide name & contacts) C. Employee/Wage earner in residential structures (provide name & contacts)									
4.7.3	Tree no.	Fruit bearing () Specify names of trees		Non-fruit bearing () Specify names of trees								
4.7.4	Well/Tube well (No)											
4.7.5	Others (specify)											

* (1) Residential- 1.1 house, 1.2 hut, 1.3 other; (2) Commercial- 2.1 shops, 2.2 hotel, 2.3 small eatery, 2.4 kiosk, 2.5 petrol pump, 2.6 clinic, 2.7 STD booth, 2.8 workshop, 2.9 vendors, 2.10 commercial complex, etc; (3) Mixed category- 3.1 residential cum commercial; (4) Community type- 4.1 Comm center, 4.2 Club, 4.3 Trust, 4.4 Memorials, 4.5 Others; (5) Religious structure- 5.1 temple, 5.2 church, 5.3 mosque, 5.4 gurudwara, 5.5 shrines, 5.6 sacred grove, 5.7 others; (6) Govt structure- 6.1 Govt office, 6.2 hospital, 6.3 school, 6.4 college, 6.5 bus stop, 6.6 others; (7) Other structure- 7.1 boundary wall, 7.2 foundation, 7.3 cattle shed, 7.4 other

5.0 Information on Head of PAH

5.1	Name of owner or occupier of property affected											
5.2	Father's/ Mother's name of property owner											
5.3	Name of Respondent and relationship to owner											
5.4	Age of Respondent											
5.5	Mob. No. of owner of property											
5.6	Relation of respondent with Head of Household (HH): (Encircle the option)											
	Self-1	Wife-2	Son/ Daughter -3	Parent-4	Brother- 5	Sister-6	Others (specify)-7					
5.7	Name of Head of Household:											

		Religion: (Encircle the option)						
5.8	Hindu	Muslim	Christian	Buddhist	Jain	Parsi	Sikh	Others (Specify).....
5.9		Social Category: (Encircle the option)						
	General -1	SC-2	ST-3	BC/OBC (Creamy layer) -4	BC/OBC (Non-creamy layer) -5	Others (specify.....)-6		
5.10	Vulnerability status of Head of household: BPL-1, WHH (Widow, Separated, unmarried female above 18 yrs, etc), Disabled- 3, Destitute-4, Orphan-5, Landless-5, Elderly person without dependent- 6, ST-7, Others (specify)- 8.							
5.11	If, ST then name of Tribe:							
5.12	What all cards do you have?				BPL			
					Antyodaya			
					Annapurna			
					None			
5.13	Which identity documents the owner of the property has (Provide any one identity number among below)							
	Ration Card	Voter ID		PAN card		Aadhar	License No.	
5.14	Is anyone in your household beneficiary of any Government scheme? Yes – 1; No- 2							
	5.14.1 If yes, please tell us the name of the scheme							

6.0 Total Land and Persons associated with the affected property/assets

6.1	Person (s) associated with land	Landowner -1, Sharecropper-2, Contract farmer – 3, Lease holder - 4, Agricultural Laborer-5, Others - 6 (specify.....)					
6.1.1	Annual rent/ crop share to be paid to owner, if answer in Q. No. 6.1 is other than land owner?						
6.1.2	1. If other than land owner, name of persons permanently dependent on land					i.	
						ii.	
	2. Permanent workers associated with Commercial structure					i.	
						ii.	
6.2	Land to be acquired (owned by the affected person)						
	Type of Land	Area (in Acre)		Market Rate (Rs.)/Acre	Location	Trees, Crops grown	
		Total	To be Acquired				
	Irrigated						
	Non-irrigated						
	Barren						
	Forest						
	Orchard						
Pasture/ wasteland							
Other (if any)							
6.3	Type of Crops grown (mention the crop in order to priority i.e. Production volume/value in a year, if necessary put in remarks how many cropping cycles in a year, price per quintal in past year)						
	6.3.1	Khariif (Quintal)					
	6.3.2	Rabi (Quintal)					
	6.3.3	Others (Quintal)					

6.4	Total annual cash income from agriculture (Rs./yr.)				
6.5	Tenant/Lessee/Share cropper/contract farming agent (Name and contact no) engaged for the affected assets				
6.6	Name and contact no of permanent agricultural laborers/ workers employed at affected assets				
6.7	Other person livelihood depend upon the affected assets				
6.8	Other Lands owned by the affected household (Occupier)				
	Type of Land	Area (in Acre)		Location	Crops grown
		Total	To be Acquired		
	Irrigated				
	Non-irrigated				
	Barren				
	Forest				
	Orchard				
Pasture/ wasteland					
Other (if any)					

7.0 If displaced, do you have other available land to shift? 1Yes ___ 2No _____

8.0 Resettlement/Relocation Option: 1. Self-Relocation ___ 2. Project Assisted Relocation _____

9.0 Compensation Option for those losing land: 1. Land for land 2. Cash for land

Why? _____

10.0 Compensation Options for those losing Structures: 1. Structure for structure 2. Cash for Structure lost

11.0 Income restoration options? ___

- Employment opportunities in construction work
- assistance/loan from other ongoing development scheme
- Vocational training
- others _____

12.0 Profile household members (** Refer Code below table)

S. No	Name of Household member	Relation with HoH 1*	Sex (M/F) 2*	Age	Marital Status 3*	Education 4*	Primary Occupation 5*	Secondary Occupation	Approx. Monthly Income (Rs.)/ Remittances	Workplace 6*	If not employed has been looking for work or available for work? Y, N	Health Condition 7*	Vulnerability 8*	Illness/Symptoms within the past month 9*	Residing in Village (Y/N)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															

1*	Relation with the HH head:	[1] Head [2] Spouse [3] Child [4] Parents [5] Brother [6] Sister [7] Others (Specify)
2*	Gender/Sex	[M] Male [F] Female
3*	Marital status:	[1] Single [2] Married [3] Divorced [4] Widow/Widower
4*	Education attainment	[1] No Education [2] Below Elementary (class VIII) [3] Completed Elementary [4] Below High school (Class X) [5] Completed High School [6] Not completed College [7] Finished college (graduate or higher)
5*	Occupation:	[1] Agriculture [2] Allied Agriculture [3] Dairy [4] Forestry [5] Household/Cottage Industry [6] Business/Trader/Shop Owner [7] Skilled Profession [8] Unskilled Labor [9] Pvt. Service [10] Govt. Service [11] Retired/Pensioner [12] Unemployed but capable to work [13] Too Young to work/ disabled/ Student [14] Other: (specify)
6*	Workplace	[1] at home [2] less than 1 km [3] 1 - 2 km [4] 2 - 4 km [5] more than 4 km
7*	Health Condition	[1] Good/normal [2] disabled [3] very old/chronically ill
8*	Vulnerability Status	[1] Disabled (40% or more, check if medical certificate available) [2] Orphan [3] Elderly over 65 years with no immediate family members to support [4] Widow [5] Women headed household [6] Family in abject poverty/ destitute [7] Divorced/Single women [8] Any other (mention).....
9*	Illness/Symptoms	(1) Diarrhea, (2) skin rash, (3) fever, (4) coughing, (5) others

Census Supplementary Sheet for Occupiers

1. Census Questionnaire/Survey No:.....
2. Name of the Owner:.....
3. Name of the Occupier:.....
4. Father's Name of Occupier:.....
5. Status of Occupier :A. Agricultural Laborer B. Agricultural Tenant/Lessee C. Sharecropper D. Tenant in structure E. Employee/ wage earner in Residential/Commercial Structure
6. Social Category of AP: 1. SC 2. ST 3. OBC 4. General 5. Others (specify).....
7. Religious Category :1. Hindu 2. Muslim 3. Christian 4. Buddhist 5. Jain 6. Other (specify).....
8. Number of family members Male Female Total.....
9. Vulnerability Status of the Household: A. Is it a woman headed household? 1. Yes 2. No
B. Is it headed by physically/mentally challenged person? 1. Yes 2. No
C. Is it a household Below Poverty Line (BPL) 1. Yes 2. No
10. Annual income of the family Rs.....
11. Income Restoration Assistance (fill codes in preferred order) :1. Employment Opportunities in Construction work 2. Assistance/ Loan from other ongoing development scheme 3. Vocational Training 4. Others (specify).....
12. Details of Occupier Family Members: (fill appropriate code)

S. No.	Name of the Family Member	Age (in years)	Sex 1. Male 2. Female	Marital Status 1. Married 2. Unmarried 3. Widow 4. Widower 5. Others	Education 1. Illiterate 2. Literate 3. Up to middle 4. Below metric 5. Metric 6. Graduate 7. Above Grad. 8. Belo	Occupation 1. Service 2. Business 3. Agriculture 4. Study 5. Housewife 6. Labour 7. Unemployed 8. Professional 9. Below 6 years 10. Old/ inactive 11. Others
1						
2						
3						
4						
5						

Thanks for co-operation and your valuable time!!

SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

Questionnaire No:	
--------------------------	--

1. Name of respondent:	
Note* (Same from Census Survey – Pl copy from census format before filling responses to avoid any confusion)	
2. Age of the respondent	
3. Name of owner of property affected	
4. Father's/ Mother's name of property owner	
5. Mob. No. of owner of property	

6.0 Possession of Movable Assets

6.1 Livestock holding	No.	6.2 Agri Equips	No.	6.3 Household Items	No.	6.4 Other Assets	No.
Cow		Tractor		Coloured TV		Motorbike/ Scooter	
Ox		Power Tiller		Fridge		Jeep/car	
Buffalo		Thrasher		LPG Connection		Truck	
Camel		Combine Harvester		Microwave		Bus	
Sheep		Sprayer		Geyser		Animal driven cart	
Goat		Water Pump Set		Grain storing facilities		Other major items (specify.....)	
Others		Electric Pump set		Air Conditioner			

7.0 Sources of Household Income

Source of Income	Annual Income (Rs.)	Remark
a. Agriculture		
b. Wage Labour		
c. Business/Trading		
d. Service Sector (Govt./ Pvt.)		
e. Livestock & Animal Husbandry		
f. Fishing & Aquaculture		
g. Artisan / Cottage Craft		
h. Taxi / Transport Service		
i. Others (specify).....		
Total Income		

8.0 Transportation/Vehicles Owned

Motorcycle/Two Wheelers	Four wheelers	Others (specify.....)	None
1	2	3	4

9.0 Cooking (multiple responses likely)

LPG Cylinder	Firewood	Kerosene	Leaf/ Straw	Gas pipeline	Electric
1	2	3	4	5	6

10.0 Source of lighting

Electricity	Kerosene	Gas plant	Solar Energy	Battery
1	2	3	4	5

11.0 Sources of Drinking Water

Tap water supply	Hand Pump	Tube Well	Stream/ Pond	Well	Others (specify)
1	2	3	4	5	6

12.0 Sanitation

Individual Flush/ Pucca Toilet	Community Toilet	Kutcha/ Pit	Open defecation
1	2	3	4

13.0 Do you have bathroom? Tick for Yes/ No

Yes	Numbers	No	Numbers
If yes, then is it :		Inside house-1, Outside house- 2, Community Bathroom- 3, Open Area- 4	

14.0 Loan and Indebtedness

14.1	Have you taken loan from any source?	1. Yes. 2. No. 3. Don't Know
14.2	If yes, then is it from?	Bank- 1, micro- Finance Institution - 2; Local Money lender- 3; Relative/ Friends- 4; Others- 5
14.3	How much loan did you take? (in Rs.)	
14.4	Why did you take loan (purpose of loan)? Multiple choice possible Agriculture (seeds, fertilizers, irrigation, equipment, etc.) -1, Business purpose - 2, Land purchase -3, House construction - 4, Education of children- 5; Marriage of son/ daughter- 6, Meeting of Emergency needs - 7; Medical purpose - 8; Purchase of transport facility - 9, Purchase of consumer durables-10; Others - 11	
14.5	How much loan did you repay? (in Rs.)	
14.6	How much is balance loan? (in Rs.)	

15.0 Perception on Project

Note: To be administered as presumptive queries

15.1	Are you aware about the HORC Rail Project? Yes-1; No-2;
15.2	If yes, the how did you know about it? TV-1, Newspaper-2, Villagers-3, Govt. officials-4, Others (specify.....) -5
15.3	Do you think the project will bring any benefits to the people? 1. Yes; 2. No; 3. Don't know
15.4	Are there any other concern (s) besides impact on land, structure and other assets that would be caused by the project? 1. Yes (specify)..... 2. No 3. Don't know
15.5	Are there any suggestions to mitigate the expected concern(s)? Yes (specify)..... ; 2. No; 3. Don't know
15.6	What kind of assistance regarding resettlement and rehabilitation do you request / suggest for the Project Implementing Authority? 1 - Training for self-employment; 2. Cash grant equivalent to loss, 3. Others, Specify
15.7	In case you are to be displaced by the project, where would you like to resettle? (Tick) (choose one)
	1. In the same land plot (in case your land plot is big enough to shift the affected residential structure)
	2. In the same community area
	3. In the same district
	4. Resettlement location does not matter
	8. Others (specify)
15.8	If any anticipation of difficulty after resettlement, what are they?
	1. Find new income source
	2. Find new house
	3. Find new suitable farmland in the resettlement area
	4. Find suitable school for children
	5. Access to public facilities, utilities or services (specify)
15.9	How do you intend to use your compensation?
15.10	If you have grievances or problems in the village, how is it resolved?
15.11	If there is an issue or a grievance on the HORC Rail Project, who do you contact to resolve it?

16.0 Types of Impacts perceived

Positive impacts perceived		Negative Impacts perceived	
Increased employment opportunity	1	Loss of income	1
Speedy movement of people	2	Pressure on existing infrastructure	2
Increase in business opportunity	3	More visitors/population	3
Increase in land price	4	Conflict with outsiders	4
Improved access to cities	5	Others (Specify	5
Others (specify.....)			

17.0 Household Expenditure

Type of Expenditure	Approx. average expenditure (Rs.)	
	Monthly	Yearly
Food		
Cook fuel		
Rent		
Water		
Electricity		
Travel		
Agriculture Expenditure (seeds, fertilizer, labour, irrigation, etc)		
Education		
Health		
Clothing		
Loan repayment		
Others (specify		
Total Expenditure		

18.0 Access to Government Schemes

18.1 Have you or your household member ever availed any benefit under Central/ State Govt. scheme/ programme?

Yes -1; No-2

18.2 If yes, please give details of the benefits received under the scheme.

1. Mahatma Gandhi National Rural Employment Guarantee scheme;
2. Rashtriya Krishi Vikas Yojana
3. NRLM/ SGSY
4. Shahri Awas Yojana
5. Indira Aawas Yojana/ Pradhan Mantri Aawas Yojana
6. Others (mention name below in the table)

Name of the scheme/ programme	Kind of help/ benefit received	Name of the household member	Received in Year

18.2.1 If loan, total amount received?

18.2.2 If training, kind of training received?

18.3 After availing this scheme, did your annual income increase? Yes -1; No-2

18.4 If yes, how much in Rs?

18.5 If no, specify reasons?

19.0 Savings and Indebtedness

19.1	Total Annual Saving (Rs)			
19.2	Have you (household head) taken any loan? 1: Yes, 2: No, 3: Don't Know			
19.3	If yes, when did you take loan? Year			
19.4	Reasons/ purposes for which loan was taken (may be multiple answers) Agriculture (seeds, fertilizers, irrigation, equipment, etc) -1; Business purpose – 2; Land purchase -3; House construction-4; Education of children- 5; Marriage of son/ daughter- 6; Meeting of Emergency needs – 7; Medical Purpose- 8; Purchase of transport facility -9; Purchase of consumer durables – 10; Others - 11			
19.5	Loan Provider	Loan amount (Rs.)	Loan repaid (Rs.)	Balance to be paid (Rs.)
	Government Bank			
	Co-operative Bank			
	Relatives			
	Friend			
	Money lender (Mahajan)			
	Self-help group (SHG)			
	Chit fund			
	Others (specify.....)			

20.0 Loss of business and other income (only if commercial/ shop unit is affected otherwise skip)

20.1	a. Type of Business	b. Number of years the Business has been operating?	c. Whether operated with business license 1. Yes 2. No.	d. Average monthly gross income (Rs.)
20.1.1				
20.1.2				
20.1.3				
20.2	Is the affected business the main source of primary income?		1- Yes	2- No
20.3	Is the affected business the only source of HH income?		1- Yes	2- No
20.4	Is it self-owned or have partners?		1- Self Owned	2- Have Partners
20.5	If have partners, how many? (in nos.):			
20.6	How many persons have you employed? (in nos.):			

21.0 What kind of resettlement & rehabilitation assistance would you prefer? (Applicable only for those who will be physically displaced because of dismantling of structure, residential, shop, etc)?
Otherwise Skip

Self-relocation-1; Project authority assisted relocation -2, others – 3

	If self-relocation, then where would you shift?		
21.1	21.1.1	Name of the place	
	21.1.2	Distance from present location	
21.2	Do you have land in nearby area for self-relocation? Yes -1; No-2		

22.0 Is there any family member part of any Self Help Group (SHG)?

Yes -1; No-2; Don't know – 3

23.0 Survey Format for Inventory of Losses (IOL Survey)

23.1 Structure Details (Refer Coding Below)

Structure type 1*	Photo No.	GPS Location	No. of families affected 2*	Category of structure 3*	No. of Floors	Construction Material - Roof 4*	Construction Material Wall	Construction Material Floor 6*	Ownership Type 7*	If Rented – Monthly Rent

Coding for Table 23.1

Structure Type	[Private Residential] 1. Residence 2. Only House Fence 3. Detached Kitchen 4. Detached Toilet 5. Detached Bathroom 6. Storage 7. Farm House 8. Cattle Shed 9. Pond 10. Well, 11. Water tank 12. Irrigation Bore wells 13. Tube-wells for Drinking water 14. Others (specify)
	[Commercial] 15. Shop 16. Hotel 17. Small eatery 18. Kiosk 19. Petrol pumps 20. Clinic 21. STD Booth 22. Workshop 23. Vendors 24. Commercial complex 25. Other business establishment (specify, e.g Restaurants, Dhabas etc.)
	26. Residential cum Commercial
	27. Mixed Category residential cum commercial
	28. Community type- Comm. center, Club, Trust, Memorials, Others
	29. Religious structure- temple, church, mosque, Gurudwara, shrines, sacred grove., others,
	30. Govt. structure- Govt. office, hospital, school, college, bus stop, others
	31. Other structure- boundary wall, foundation, cattle shed, other
	[A] House Owners..... [B] Registered Lease holders.....
	[C] Tenants...[D] Illegal [E] No. of employees (if commercial structure) Occupiers/Squatters.....[F] Others.....
[G] Total families.....	
Category of structure	1: Pucca 2: Semi pucca 3: Kutcha 4. Shanties 5: Tents or tentative simple hut
Construction Material - Roof	1: G.I. sheets 2: Tiles 3: Natural materials 4: Concrete 5. Plastic sheet/scrap material 5: Others (specify)
Construction Material -Wall	1. All Brick/concrete 2. Brick and wood mixed 3. Wood 4. Natural Material 5. Plastic/scrap material 6. Others
Construction Material - Floor	1. Marble/ Tile 2. Pucca, 3. Brick 4. Earth 5. Others
Ownership Type	1. Owner 2. Tenant 3. State owned structure on rent/lease group/society 4. Encroacher 5. Squatter 6. Illegal Occupier

23.2 Details of structures/ assets affected

Structure affected	Present use	Dimension of structure (in Meters)						% area affected	No. of storey	Category of structure (P/SP/K)	Likely displaced/Not displaced (Yes/No)
		Total	Affected	Total	Affected	Total	Affected				

24.0 Are there any tenants in your structure? Yes -1, No. 2

If yes, how many?

Name of tenants: (1)(2).....(3).....

25.0 (i) How grievances are addressed & redressed in the community:

Grievance Type	Common Grievance addressal tools used					Others
	Mutual understanding	Consultation with influential one (specify agents)	Khap Panchayat level consultation/ settlement	Police level settlement	Court level settlement/ judgement	
Assets (land and structure) Ownership Conflict						
Owner-Tenant/lessee/share cropper/contract farming agent conflict						
Farmers – labour; Operator/owner – worker conflict						
Social & religious conflict (cast, community, related)						
Gender and sex related conflict						
Scheme implementation related grievance						

*Retired officers/personnel; spiritual person, community leader, head of temple/mask; community representative; others specify

(ii) Roles of women and girls in the community and decision making at the household level as part of gender analysis

S. No	Community and Household Level Activity	Who take decision (Men/Women/girls)
1	Community level socio-economic conflict and opportunity related decision	
2	Community level religious and institutional conflict and opportunity related decision	
3	Community level gender grievance related decision	
4	Household decisions for the following	
4.1	Economic decision (employment, earning and expenses)	
4.2	Health decision	
4.3	Education related decision	
	1. Boys Education	
	2. Girls Education	
4.4	Relative and socialization related decision	
4.5	Marriage related decision	
	1. Family member Marriage	
	2. Boy marriage	
	3. Girls marriage	
4.6	Ritual and cultural decision	
4.7	Others (specify) 2	
4.8	Others (specify) 3	
4.9	Others (specify) 4	

26. Assessment by surveyor: Whether the affected household (whose structure – house, shop, etc are affected) would require relocation?

Yes-1; No-2; Not sure at the moment - 3

Thanks for co-operation and your valuable time!!

Annexure 1.5

Format for Public Consultation during Focus Group Discussion

Date.....

Chainage.....

Location.....

Habitation.....

Panchayat.....

Tehsil.....

District.....

Supervisor Name.....

S. No.	Issue Raised	Suggestion Made	Remark
1			
2			
3			
4			
5			

S. No.	Issue Raised	Suggestion Made	Remark
7			
8			
9			
10			
11			
12			

Gender Response from PAPs

S. No.	Query	PAPs response
1.	What are the activities of women and girls that will be disrupted due to the project?	
2	What do the women think about the potential risks and impacts of the project activities during (i) ongoing construction (construction camps and workers' influx, potential employment of women, Gender based violence and harassment, etc), and (ii) operations phase (potential employment, welfare of women riders and staff during operations, etc)	
3	How do women, girls and children, and other vulnerable groups like elderly and those with disability use transport system, including the proposed railway system promote benefit and welfare for them? What design enhancements are proposed to address their needs and requirements	
4	Others, please also check the literature I shared earlier	

PARTICIPANT DETAILS

S. No.	Name with Father or Husband Name	Contact No.	Address	Signature
1				
2				
3				
4				
5				

S. No.	Name with Father or Husband Name	Contact No.	Address	Signature
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

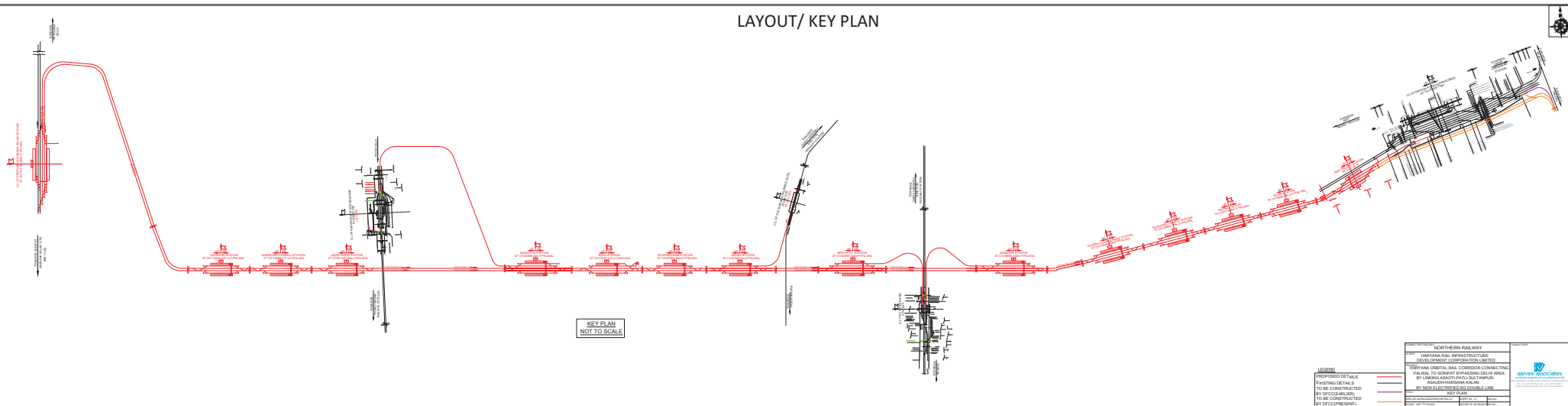
S. No.	Name with Father or Husband Name	Contact No.	Address	Signature
16				
17				
18				
19				
20				
21				

Signature of Supervisor

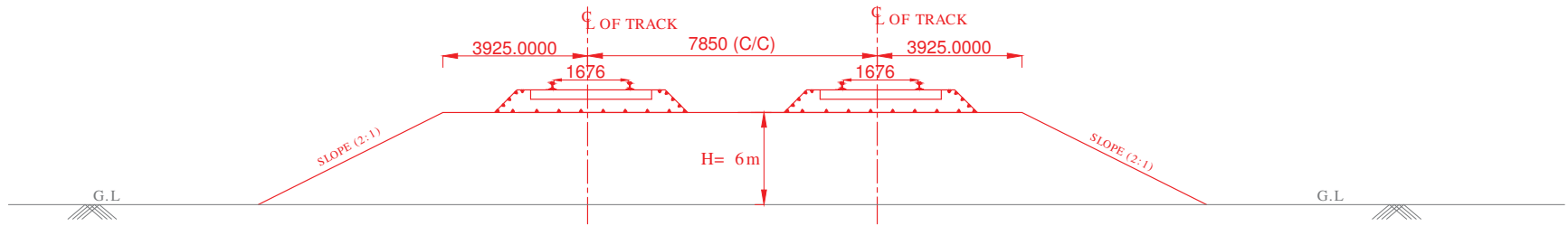
Signature of Field Coordinator

Annexure 2.1

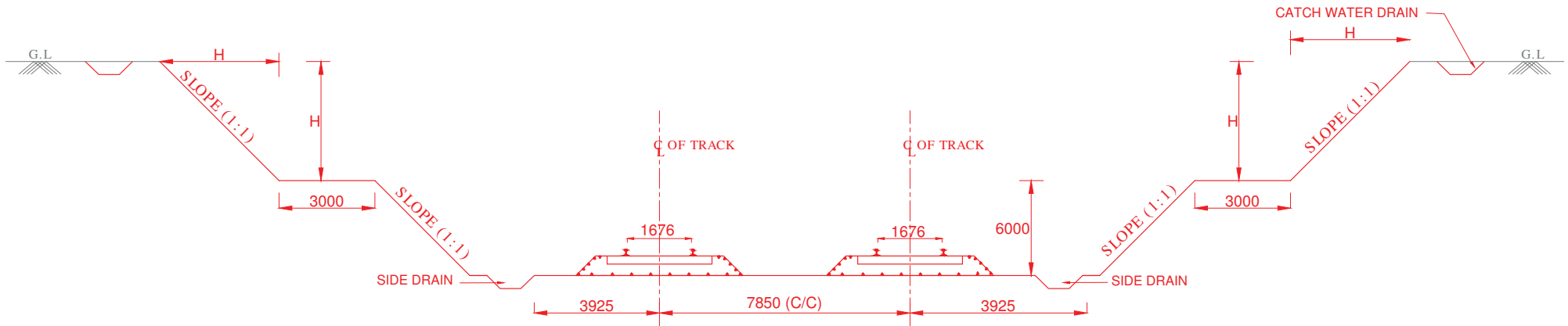
LAYOUT/ KEY PLAN



TYPICAL DOUBLE LINE CROSS SECTION





DOUBLE LINE EMBANKMENT UP TO 6M HEIGHT



DOUBLE LINE CUTTING UP TO 6M DEPTH

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS

CONNECTING RAILWAY: NORTHERN RAILWAY		CONSULTANTS
DIVISION: NEW DELHI		 arvee associates architects engineers & consultants pvt.ltd 4/10, Bhandarkar, Durgam Chokli, Pune-411 004, India Tel : +91-40-23773633, Fax : +91-40-23773637 e-mail: arvee@arvee.com, info@arvee.com
CLIENT:  HARYANA RAIL INFRASTRUCTURE DEVELOPMENT CORPORATION LIMITED.		
PROJECT: HARYANA ORBITAL RAIL CORRIDOR CONNECTING PALWAL TO SONIPAT BYPASSING DELHI AREA BY LINKING ASAOTI-PATLI- SULTANPUR-ASAUDH- HARSANA KALAN BY NEW ELECTRIFIED BG DOUBLE LINE		
TITLE: TYPICAL CROSS SECTIONS		
DRG.NO:AA/Rly/2245/HR/DC/TYP/ Rev-0	SHEET No: 1/1	Rev.No:
SCALE: NOT TO SCALE	ISSUED Dt: 26 - 04 - 2019	Rev.Dt: :

POWER INFRASTRUCTURE & ELECTRICAL ENGINEERING WORK

Broad Scope of work

- The objective of this study is to facilitate and develop an orbital rail corridor connecting Palwal and Sonipat with suitable Rail corridor by easing out the Delhi region from the freight traffic movement by allowing shifting from radial and inner ring rail network to the proposed corridor. Boost Industrial growth of cities around Delhi region namely Sohna, Manesar, Gurugram, Jhajjar, Rohtak etc also helping in developing Multi Modal Hubs in NCR region of Haryana.
- In this connection Orbital Rail Corridor from Palwal to Sonipat by linking New Palwal-Harsana Kalan by new BG line is proposed and it is to be electrified with 25 KV, single phase, 50 Hz, High raised OHE by anticipating DFCCIL traffic in near future.
- The proposed section is having broad gauge (1676 mm) and total length is near 143.932 Route KM & Over Head Conductor Track Km length is 305 TKM. The proposed Railway Electrification project mainly consists of the following works:
 - i. To construct electric power supply system including 220, 132 KV D/C transmission line from SEB Grid substation to TSS & modification in Grid Substation.
 - ii. To construct Traction Substation and Switching posts.
 - iii. To construct Over Head Equipments (High raised OHE) and Supervisory Control and Data Acquisition System (SCADA).
 - iv. To modify power line crossings of 11/33/66/132/220/400/765 kV.
 - v. To electrify Railway stations and associated service buildings
- The Salient features of the project are as under:
 - i. Total section length Route Km – 143.932 RKM
 - ii. Over Head Conductor Track Km length - 305TKM
 - iii. TSS proposed- 2 Nos.
 - iv. SP/SSP proposed- 12 nos.
 - v. Stations Electrification -15 nos& Platform Lighting- 30 nos.
 - vi. OHE/PSI Depot - 2 nos
 - vii. Tower Wagon Shed - 2 Nos.

Introduction

- There are 15 stations proposed at following locations for electrification

1) New Palwal, 2) Silani, 3) Sohna 4) Dhulawat, 5) ChanndlaDungerwas , 6) Manesar, 7) New Patli 8)Badsa, 9) DeberkhanaKheri 10)Badli, 11) Mandothi, 12) JasaurKheri, 13) Kharkorda, 14) Tarakpur, 15) New Harsana Kalan,

- **TSS** - Traction Substations with 2x21.6 MVA transformers have been proposed at the following locations for power supply to the sections.

S.No.	Station	Rating	Capacity
1	Dhulawat	220/27.5 kV	2x21.6 MVA
2	Mandothi	220/27.5 kV	2x21.6 MVA

- Sub-Sectioning and Paralleling Post (SSP) and Sectioning and Paralleling Posts(SP) have been proposed at the following stations for sectioning and sub-sectioning in view of maintenance and fault isolation.

Sub-Sectioning and Paralleling Post (SSP)

S.No	Name of Station
1	New Palwal
2	Sohna
3	ChanndlaDungerwas
4	Manesar
5	DeberkhanaKheri
6	Badli
7	JasaurKheri
8	Kharukoda
9	Harsanakalan

Sectioning and Paralleling Post (SP)

S.No	Name of Station
1	Silani
2	Badsa
3	Tarakpur

Design Specifications of Overhead Catenary System:

- A simple polygonal type of overhead equipment is comprising of a single 65 sq.mm, size Catenary wire of Cadmium Copper and a copper Contact wire of 107 sq. mm size suspended from the Catenary by 5 mm dia copper dropper wire spaced 9 meters apart. The OHE is supported by swiveling type Cantilever bracket assembly. A tension of 1000 kgf is given in each conductor i.e. Catenary and Contact wire. This tension is kept constant, automatically compensating the variations in conductor length due to change in temperature through the regulating equipment erected at the conductors, also known as Automatic Tensioning Device.
- The OHE span varies between 54 Meters and 27 Meters with a step of 4.5 m. The maximum span of 54 m is adopted on section having wind pressure of 155

kgs/sq m. The span is reduced on curvature depending upon the degree of curvature.

- The electrical clearance between live part, and earthed part i.e. fixed structures or moving load shall be maintained normally as large as possible. The minimum clearance under worst condition of temperature, wind etc. are given below:

Minimum Vertical & Horizontal clearance

- a) Long duration - 250 mm
- b) Short duration - 200 mm

- The OHE conductors are terminated at maximum intervals of 1.5 kilometers and suitably anchored. The changeover is made by overlapping the conductors, normally on 3 spans or 4 spans. The Conductors height at support is so adjusted that the conductors are physically clear from any obstruction under all conditions as well as the pantograph glides over from one conductor to another smoothly without any spark. There are two types of overlap:

Un-insulated Overlap

In this type of overlap the distance between two conductors is kept 200 mm and the conductors are permanently connected by jumpers to have electrical continuity.

Insulated Overlap

- In this case, the two OHE conductors are kept apart at a distance of 500 mm. The electrical continuity at the insulated overlap is bridged by Interrupter or Isolating Switches except at Neutral Section (SP).
- In regulated OHE, to ensure uniform distribution of the mechanical tension in the OHE conductors, an anti-creep point is installed at the midpoint of the tension length of OHE conductor.
- Section Insulators are provided to insulate the OHE of one track and another track, such as at turn outs & cross over, and to separate secondary tracks and sidings from the main line or other sidings.
- When the pantograph of a locomotive passes from one track to another along a cross over, current collection changes from one OHE to another. The runners do have the overlap so that there may not be any sparking during change over.
- Solid Core Porcelain / Composite Insulators are used to support the OHE at Bracket and Stay arm Insulators. For termination 9 ton insulators are used.
- OHE Parameters:

1	Height of Double Stack Container	7100 mm
2	Height of Contact Wire at support from Rail Level	7570 mm
3	Height of Contact Wire at mid span from Rail Level	7520 mm

4	Height of Catenary Wire at support from Rail Level	8970 mm
5	Pre sag at mid span	50 mm
6	Max stagger at Tangent Track	+ or – 150 mm
7	Max stagger at Curves	+ or – 250 mm
8	Standard Encumbrance	1.40 mtr
9	Speed	140 KMPH
10	Type of Mast	B-150/B-175/B-200/B-225/B-250
11	Mast Length	11.4 Mtr
12	Min Implantation	2.8 Mtr
13	Max Tension Length	1.5 KM
14	Catenary Wire	65 Sq mm
15	Contact Wire	107 Sq mm

Traction Sub Stations (TSS):

- The function of Traction Sub-station is to transfer the power provided by the power system into the power that is suitable for electric traction and power supply method.
- Every TSS has 2 Nos. traction transformers out of which one is working at a time and the second transformer is stand by. The capacity of each traction transformer is sufficient to feed its own feed zone and half of the adjoining feed zone
- The power at each of the above Traction Sub-Stations will be received through 132kV/220 kV Transmission line/underground cable to be constructed by HRIDC through State Electricity Company and the Gantry towers/ cable bushing insulators for connection to the Traction Sub-Stations will be installed by HRIDC. The power as received from State Electricity Board (SEB) will be 132kV/220 kV and stepped down to 25kV by means of 132kV/27.5 kV, Traction Transformers. 132kV/27.5 kV Traction Transformer will supply power to the 25kV indoor Feeding Post, which will feed traction power to the OHE by outgoing feeders.
- Numerical Relays shall be provided in the Control and Relay Panels for protection of the equipments, feeding sections and power factor correction devices.
- Feed Length
The distance for which a traction transformer will feed power in emergent conditions i.e. the distance between two adjoining FPs.
- Elementary Section (ES):
This is the shortest section of the OHE which can be isolated manually for carrying out OHE maintenance work.

- Major Equipments for OHE:

Following are the main activities for completion of the Overhead Catenary System:

- Foundations:

The foundation bending moment codes (FBM) for each location are obtained from the mast employment schedule or by actual calculations. Bearing capacity of soil is determined at the outer toe of the bottom of foundation at a representative number of locations. Type of foundations for mast and portals are as follows:

- a) Side Bearing
- b) Side Gravity
- c) Pure Gravity
- d) Black Cotton Soil (NBC/WBC)
- e) Foundations in soft Rock
- f) Foundations in Hard Rock

- Selection of Foundations:

- a) Side Bearing Foundations are used for Masts where soil bearing capacity is 11,000 or 21,000 kg/sqm and 300 mm wide shoulder is available on the bank.
- b) New pure gravity foundations may be used for masts where soil bearing capacity is 5500, 8000 & 11,000 kg/sqm or where adequate shoulder is not available.
- c) Side gravity foundations may be used for masts where soil bearing capacity is 8000 & 11,000 kg/sqm or where adequate shoulder is not available. No portion of the foundation shall be exposed.
- d) Pure gravity foundations may be used for masts where soil surrounding the foundation is loose and cannot exert passive pressure on the foundations.
- e) The foundation of the Black Cotton Soil shall be done preferably in dry season.
- f) The foundation of the soft and hard Rock soil shall be used for Rock zone.

- Contact Wire & Catenary Wire:

The Catenary wire comprises of Cu Mg, 65 sq.mm cross-sectional area. The contact wire is a solid hard drawn grooved electrolytic copper 107 mm 2 cross - sectional area. Total current carrying capacity of both wires is 600 Amps Contact Wire Height:

Normally the height of the Contact wire above the track plane shall not be less than 7.52 m at any point in the span under the worst temperature conditions. To ensure this, the normal height of contact wire at the suspension point shall be as under:

- a) Regulated OHE : 7.57 m

Cantilever Assembly:

It is an insulated swiveling type structural member, comprising of different sizes of steel tubes, to support and to keep the overhead Catenary system in position so as to facilitate current collection by the pantograph at all speed without infringing the structural members. It consists of the following structural members.

- i. Stay arm - It comprises of dia. 28.4/ 33.7 mm (Small) size tube and an adjuster at the end to keep the bracket tube in position. It is insulated from mast by stay arm insulator.
- ii. Bracket tube - It comprises of dia 40/ 49 mm (large) or dia 30/38 mm (standard) bracket tube and insulated by bracket insulator. Catenary is supported from this member by Catenary suspension bracket and Catenary suspension clamp.
- iii. Register Arm - It comprises of dia 28.4 x 33.7 mm tube to register the contact wire in the desired position with the help of steady arm.
- iv. Steady arm assembly: It is 32 x 31 mm BFB section made of aluminium alloy to register the contact wire to the required stagger and to take the push up of contact wire. It is always in tension.

Mast / Steel Structures:

As a standard practice, an independent mast is used to support the OHE for each track to obtain mechanical independence. Steel Galvanized masts are of Four types i.e., B.F.B (Broad Flanged Beam), RSJ (Rolled Steel Joist) and fabricated rectangular section mast of K and B type. Special care shall be taken in pollution areas.

Portals are also used to serve multiple track section where space between two tracks to locate an independent mast is not adequate. There are three types of Portals in use i.e. N, O & R type. P.G. and double BFB type uprights are used where track separation is less. All Masts & Portals are galvanized before installation.

A single vertical post embedded in the foundation or otherwise rigidly fixed in vertical position to support the overhead equipment with cantilever assembly. It may be rolled section or fabricated. The uprights of portals and TTCs are also called masts.

Traction Mast/Portals are embedded in the concrete foundation. There are different type of foundations which are used according to soil pressure and location.

Neutral Section:

A short section of insulated dead overhead equipment which separates the sectors fed by two adjacent substations which are normally connected to different phases.

Section Insulator:

A device installed in the contact wire for insulating two elementary electrical sections from each other while providing a continuous path for the pantograph without break of current.

Supply Control Post:

It is general term which refers to an outdoor assembly of control gear, such as interrupters, isolators, potential transformers, auxiliary transformers, etc. including remote control equipment installed in a cubicle, for controlling power supply to overhead equipment.

- a) Feeding Post (FP) - It is a supply post where the incoming 25 kV feeder lines from substation are terminated and connected to the overhead equipment through interrupters.
- b) Sectioning and Paralleling Post (SP) - It is the supply control post situated midway between two feeding posts at the neutral section and provided with bridging and paralleling interrupters.
- c) Sub-sectioning and Paralleling Post (SSP) - It is a supply control post where sectioning and paralleling interrupters are provided.
- d) Sub-sectioning Post (SSP) - (for single line section): It is a supply control post where a sectioning interrupter is provided.

Sector

A Sector is defined as a section of Overhead equipment of a track which can be energized by closing a feeder circuit breaker at the substation.

- a) Sub-sector - The smallest section of overhead equipment which can be isolated remotely by opening of interrupters.
- b) Elementary Section - The smallest section of overhead equipment which can be isolated from the rest of the system by manual operations.

Neutral Sections

PTFE type short neutral section shall be erected on tangent track only. The stagger shall be zero at support.

If adoption of short neutral section on main line is unavoidable, short neutral section of ceramic beaded resin bonded glass fibre rod insulators be provided.

This is lighter and is considered fit for speeds upto 130 km/h.

Note: Ceramic beaded rod insulator type neutral section equipment have not yet been developed indigenously and are still under trial.

Regulated equipment

With regulated overhead equipment every tension length is equipped with an automatic tensioning device at each end and an anti-creep located approximately midway between the tensioning devices. The distance between the anti-creep and the anchor mast/ structures on either side should not exceed 750 m or 15 supporting masts.

Fittings

For the conductor connection and termination anchor clamp, they directly bear the operation tension of the conductor and exert the largest force in OHE parts, so the requirement of the material strength and ductility is very high. Normally alloy or aluminum bronze alloy is used.

The OHE estimate shall be prepared duly considering OHE components to latest RDSO and CORE approved makes and the OHE work shall be executed as per railways standards and specifications.

OHE layout plan, sectioning diagram, general power supply arrangements along with associated drawings shall be submitted for approval of Railway after approval of DPR and Engineering scale plan, prior to starting of OHE works. All types of foundation, steel structures, and conductors, power supply equipment; all fittings (ferrous and non-ferrous) insulators and execution processes and practices are covered by relevant specifications issued by RDSO and CORE

Isolation Arrangements

The lines in yards and sidings are proposed to be isolated using section insulator assembly and single or double pole isolators. Lines having loading/unloading facilities shall be provided with double pole isolator with section insulators, earthing heel at one end and double section insulator with single pole isolator and earthing heel at the other end.

Necessary Aluminium along track feeder line will be provided up to IOLs, PTFE sections.

Due to dust pollution in the loading & unloading area the OHE shall be erected with provision of long creep-age path porcelain insulators to avoid insulator failures.

SCADA Facilities

SCADA (Supervisory Control and Data Acquisition) system to be installed for remote sensing and control of traction power at the requisite remote control centre. Seamless integration of the new SCADA equipments and software for new work shall be of utmost priority. The new SCADA equipments shall be in conformity to RDSO standard specifications



General Electrical Works

There is requirement of electrification and illumination of all the station buildings, staff quarters, platforms and other service buildings which are essential part of the smooth operation of the railway system. All the service buildings are proposed to be electrified. Adequate illumination levels are to be maintained at station yards, platforms, buildings, staff colonies etc.

11kV /440 v sub-stations are proposed at stations for power supply to station buildings, platform lighting, staff quarter and colony, water pumping stations etc. Power for these substations shall be tapped from local power distribution network.

Staff Quarters and Service Buildings:

All staff quarters and service buildings shall be electrified. Fitting and fixtures conforming to latest building code and railway scale of fittings shall be provided at all buildings. Required local power supply arrangement for all stations, OHE/PSI depot has been considered in the estimate.

Modification of Power Line Crossings

Power lines crossing, if any, in the proposed alignment shall be suitably diverted so as not to infringe the handling operations. As per 1987 regulation for Power Lines crossing of Railway Tracks act (latest) Crossings of Voltage level up to and including 33 kv shall be made under ground.

The details of power line crossings occurring across the alignment & associated cost of their modification has been tabulated with theirs voltage levels mentioned below:

EHV Power Line Crossings

Voltage KV	Ground level	Proposed rail level	Clearance = (GL-RL)	Conductor Height from GL	Conductor Height from RL	Traction conductor height (cantenary height)	Minimum clearance required from highest traction conductor and lowest transmission conductor	Present Clearance	Remarks
220	197.529	205.675	8.146	30.12	21.974	8.92	4.58	13.054	
400	200.155	206.139	5.984	19.06	13.076	8.92	5.49	4.156	Modification Required
400	193.701	202.201	8.5	13.58	5.08	8.92	5.49	-3.84	Modification Required
220	192.136	201.520	9.384	12.92	3.536	8.92	4.58	-5.384	Modification Required
132	191.776	208.018	16.242	14.65	-1.592	8.92	3.05	-10.512	Modification Required
400	200.992	221.895	20.903	15.05	-5.853	8.92	5.49	-14.773	Modification Required
66	267.361	236.365	-30.996	14.06	45.056	8.92	2.44	36.136	
220	263.944	249.844	-14.1	19.76	33.86	8.92	4.58	24.94	
66	262.227	254.569	-7.658	28.54	36.198	8.92	2.44	27.278	
66	260.461	259.069	-1.392	29.94	31.332	8.92	2.44	22.412	

Voltage KV	Ground level	Proposed rail level	Clearance = (GL-RL)	Conductor Height from GL	Conductor Height from RL	Traction conductor height (cantenary height)	Minimum clearance required from highest traction conductor and lowest transmission conductor	Present Clearance	Remarks
765	254.067	261.108	7.041	19.00	11.959	8.92	7.94	3.039	Modification Required
220	258.365	269.956	11.591	13.41	1.819	8.92	4.58	-7.101	Modification Required
110	253.254	256.319	3.065	17.48	14.415	8.92	3.05	5.495	
765	228.789	239.608	10.819	13.41	2.591	8.92	7.94	-6.329	Modification Required
220	226.270	237.508	11.238	23.30	12.062	8.92	4.58	3.142	Modification Required
400	219.276	226.467	7.191	11.11	3.919	8.92	5.49	-5.001	Modification Required
220	219.279	226.277	6.998	24.50	17.502	8.92	4.58	8.582	
400	210.551	222.115	11.564	24.98	13.416	8.92	5.49	4.496	Modification Required
765	213.399	221.115	7.716	36.06	28.344	8.92	7.94	19.424	
765	212.132	218.778	6.646	19.81	13.164	8.92	7.94	4.244	Modification Required
765	212.479	217.108	4.629	25.49	20.861	8.92	7.94	11.941	
132	212.408	218.442	6.034	19.81	13.776	8.92	3.05	4.856	
765	212.706	219.228	6.522	25.49	18.968	8.92	7.94	10.048	
132	212.706	219.228	6.522	16.96	10.438	8.92	3.05	1.518	Modification Required
400	212.111	219.220	7.109	22.55	15.441	8.92	5.49	6.521	
220	211.424	218.161	6.737	13.88	7.143	8.92	4.58	-1.777	Modification Required
765	211.801	219.708	7.907	29.08	21.173	8.92	5.49	12.253	
765	212.802	221.577	8.775	21.67	12.895	8.92	7.94	3.975	Modification Required
765	212.948	226.969	14.021	17.63	3.609	8.92	7.94	-5.311	Modification Required
765	216.776	224.541	7.765	20.56	12.795	8.92	7.94	3.875	Modification Required

Abstract Cost Estimate

General Electrification cost for proposed Orbital Rail Corridor from Palwal to Sonipat by linking Asaoti – Patli – Harsana Kalan by new BG line

S.N.	Description	Qty.	Unit	Rate	Amount
1	Modification of SEB's 11KV HT electrical track crossing	5	Nos	860000	4300000
2	Modification of SEB's 132/220 KV EHT electrical track crossing	6	Nos	21800000	130800000
3	Modification of SEB's 400 KV EHT electrical track crossing	5	Nos	32800000	164000000
4	Modification of SEB's 765 KV EHT	6	Nos	80000000	480000000

S.N.	Description	Qty.	Unit	Rate	Amount
	electrical track crossing				
5	Modification to LT track crossing by using U/G cables	15	Nos	262071	3931065
6	Electrification of station building with S&T Structure	15	Nos	1198029	17970435
7	Electrification of Platform	30	Nos	1064847	31945410
8	Electrification of Cover shed (96 Sq.M each)	30	Nos	173884	5216520
9	Electrification of following Type-III staff qtrs	40	Nos.	146080	5843200
10	Electrification of following Type-II staff qtrs	200	Nos.	118832	23766400
11	Providing Submersible Pump Sets for Bore	15	Nos.	395568	5933520
12	Providing Submersible Pump Sets for Sump	15	Nos.	253453	3801795
13	Electrification of FOB as per	15	Nos.	206619	3099285
14	Electrification of AEN & PWI, ADEE office etc	4	Nos	1001189	4004756
15	Electrification IOW Store , Camp office and goods booking office and shed	4	Nos	4799444	19197776
16	DG Set	15	Nos	339895	5098425
17	High MAST 20MTR	15	Nos	500000	7500000
18	Tunnel	5.2	KM	3099917	16119568
19	TSS Control room Building & Yard lighting	2	Nos	802700	1605400
20	Tower Wagon shed Electrification	2	Nos	420557	841114
21	OHE/PSI Depot Electrification	2	Nos	104468	208936
	Sub- Total for General Electrical Works				935183605
	Add contigency including PMC Charges @ 3%				28055508
	Grand Total				963239113

25KV single Phase High Raised Overhead Electrification Cost

S.No	Description	Amount
1	OHE -GENERAL	29275839
2	SWITCHING POST BUILDING	7900685
3	OHE-FERROUS OTHER THAN STEEL STRUCTURES AND SPS	269917499
4	OHE NON-FERROUS 'A'	527980148
5	OHE NON-FERROUS 'B'	39957443
6	TSS	174276116
7	TSS SPARE	4132940
8	TOOLS AND PLANT(OHE & PSI)	7719872
9	SCADA	34043166
10	COMMON SCHEDULE OF OHE/TSS	
a	GALVANISED STEEL STRUCTURES	676494491
b	CONCRETE FOR FOUNDATION	213576326
c	MISCELLINEOUS	55053314
	Sub Total for RE Works	2040327838
	PAYMENT TO POWERSUPPLY AUTHORITY	401215178
	VEHICLE FOR MAINTENANCE ORGANIZATION	9342330
	FURNITURE FOR ADEE OFFICE AND OHE DEPOT	434494
	TOTAL ESTIMATED COST	2451319839
	CONTINGENCY INCLUDING PMC CHARGES	73539595
	GRAND TOTAL	2524859435

The detailed estimate is placed at Annexure-IX(A).

Annexure 2.4

HARYANA RAIL INFRASTRUCTURE DEVELOPEMENT CORPORATION					
Cost Estimation of for Construction of Tunnel					
(Twin Tunnels - 5 Km Long each)					
S.No.	Item Description	Unit	Quantity	Final Avg Rate	Amount
1	Under Ground Excavation for tunnel including temporary provision for portal for the start of tunnel excavation				
	(a) Underground Excavation with supports	Cum	278,888.73	2,443.00	681,325,156.40
	(b) Underground not requiring supports	Cum	228,181.68	1,222.00	278,838,018.46
	(c) Extra for Transportation of spoils over 2km to 10 km from shaft / portal head	Cum	253,535.21	41.00	10,394,943.41
2	Providing Structural steel fabricated ISHB 200 supports, transportation to location and erection as required	MT	5,845.02	155,921.00	911,362,047.39
3	Providing Precast RCC laggings in M20 between ISHB lattice girders	Cum	10,684.30	3,291.00	35,162,031.30
4	Providing Rock Bolts 25mm dia 3 mt long at 3.00 mt centers staggered in unsupported area and at 1.50mt staggered in supported area in both directions.	RM	77,000.00	946.00	72,842,000.00
5	150 mm thick steel fibre reinforced Shortchanging with all materials excluding Cement and steel fibre	Cum	17,914.23	25,067.00	449,056,041.01
6	100 mm thick steel fibre reinforced Shortchanging with all materials excluding Cement and steel fibre	Cum	9,771.40	25,067.00	244,939,658.73
7	Supply of fibre for shotcrete	MT	830.57	241,411.00	200,508,472.34
8	Wire Mesh 100 x 100 x 3.15 mm	MT	161.23	118,118.00	19,043,938.77
9	Drilling and grouting for consolidation behind the supports			0.00	
	a Drilling 50-65mm dia holes	Rm	42,350.00	910.00	38,538,500.00
	b. Placement of grout for consolidation grouting (excl grout)	MT	1,905.75	2,281.00	4,347,015.75
10	M30 RCC for lining of main tunnels and niches	Cum	64,105.80	7,033.00	450,856,091.40
11	M30 Kerb Concreting	Cum	3,300.00	7,033.00	23,208,900.00
12	Supply of Cement	MT	43,759.50	7,645.00	334,541,402.51
13	Supply of Reinforcement	MT	9,195.11	66,162.00	608,366,819.85
14	Providing ventilation shafts	LS			3,000,000.00
15	Provision for geological investigations	LS			10,000,000.00
16	Provision for instrumentation and electrical systems	LS			10,000,000.00
17	Provision for drainage	LS			5,000,000.00
18	Provision for access roads	LS			10,000,000.00
19	Provision for EMP	LS			5,000,000.00
Ballastless Track					
20	Construction of Ballastles Track	Per metre	10,000.00	40,565.00	405,650,000.00
21	Rails	MT	1,200.00	62,477.00	74,972,400.00
22	Fish Plate with Nuts & Bolts	Set	1,540.00	6,580.00	10,133,200.00
23	Supply of Cement	MT	5,275.00	7,645.00	40,327,375.00
24	Supply of Reinforcement	MT	1,471.88	66,162.00	97,382,193.75
				Total :-	5,034,796,206
				Provision for miscellaneous works @1%	50,347,962.06
				Total Cost :-	5,085,144,168
				Cost Per Kilometer :-	1,017,028,834
				Cost For 4.88 Kms:-	5,415,000,708

BRIDGE LIST

Annexure 2.5

S.NO.	PRO BR. NO.	Exg chainage	PRO CHAINAGE	TYPE OF CROSSING	EXG Configuration	PROPOSED SPAN	PRO TYPE OF STRUCTURE	BL	REV BL	HFL	PCL	PFB	PSL	TOP SLAB THICKNESS	WEARING COAT	Min PFL req	PFL	PRL
1	a	96/940	-7733.000	Field Channel	1 x 3 x 3	1x3x1.8	RCC Box	196.740	196.325	-	-	-	197.975	0.350	0.150	198.890	198.475	199.217
2	b	96/675	-7494.175	RUB	1 x 6 x 3.1	1x6x4	RCC Box	197.471	194.682	-	-	-	198.532	0.650	0.150	202.121	199.332	200.074
3	c	96/537	-7439.000	Balancing culvert	1 x 3 x 3	1x3x1.8	RCC Box	196.458	196.458	-	-	-	198.108	0.350	0.150	198.608	199.541	200.283
4	d	96/054	-6922.082	RUB	1 x 9.75 x 5.5	2x5x5.5	RCC Box	196.817	195.507	-	-	-	200.857	0.500	0.150	202.817	201.507	202.249
5	e	95/481	-6373.886	RUB	1 x 6 x 3.7	1x6x4	RCC Box	195.455	195.455	-	-	-	199.305	0.650	0.150	200.105	201.176	201.918
7	f	94/950	-5836.909	RUB	1 x 6 x 3.7	1x6x4	RCC Box	194.470	194.470	-	-	-	198.320	0.650	0.150	199.120	203.281	204.023
8	g	94/508	-5406.752	RUB	1 x 6 x 3.7	1x6x4	RCC Box	195.439	195.439	-	-	-	199.289	0.650	0.150	200.089	203.985	204.727
9	h	94/053	-4940.905	RUB	2 x 6 x 3.7	2x6x4	RCC Box	194.663	194.663	-	-	-	198.513	0.650	0.150	199.313	204.246	204.988
10	j	93/654	-4539.889	Major RUB	2 x 30.5	2x30.5	OWG	195.766	195.303	-	-	-	201.303	1.302	0.000	203.068	202.605	203.347
11	k	93/498	-4374.098	Minor	2 x 4.6 x 4.9	2x5x2.5	RCC Box	196.174	196.174	198.456	0.068	2.380	198.524	0.550	0.150	199.456	200.836	201.578
12	m	93/100	-4123.090	RUB	2 x 6 x 5.6	2x6x6	RCC Box	194.971	194.445	-	-	-	200.295	0.600	0.150	201.571	201.045	201.787
13	n	Nil	-3746.000	Balancing culvert		1x2x1.8	RCC Box	193.047	193.047	-	-	-	194.697	0.350	0.150	195.197	201.359	202.101
14	p	92/275	-3023.198	RUB	2 x 6 x 5.6	2x6x6	RCC Box	195.222	195.222	-	-	-	201.072	0.600	0.150	201.822	201.961	202.703
15	q	91/578	-2523.173	RUB	1 x 3.6 x 4.9	1x4x5	RCC Box	195.363	195.363	-	-	-	200.213	0.450	0.150	200.813	202.377	203.119
16	r	91/578	-2350.647	Canal	1 x 2.5 x 4.9	1x3x5	RCC Box	195.135	195.135	-	-	-	199.985	0.400	0.150	200.535	202.521	203.263
17	s	91/044	-1867.978	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	194.991	194.991	-	-	-	199.341	0.450	0.150	199.941	202.922	203.664
18	1	90/539	-1492.897	RUB	1 x 6 x 8.1	1x6x5	RCC Box	195.283	195.283	-	-	-	200.133	0.650	0.150	200.933	203.181	203.923
19	2		-1476.983	Major	1 x 24.4	1x24.4	Composite Girder	192.972	192.972	196.342	4.578	6.839	200.920	2.236	0.025	199.635	203.181	203.923
20	3		-1464.388	RUB	1 x 6 x 8.1	1x6x5	RCC Box	195.360	195.360	-	-	-	200.210	0.650	0.150	201.010	203.181	203.923
21	4	90/250	-1307.181	RUB	1 x 12 x 5.5	2x6x5.5	RCC Box	195.525	195.525	-	-	-	200.875	0.600	0.150	201.625	203.254	203.996
22	5	90/245	-1280.000	Balancing culvert	1 x 1.2 x 1.2	1x2x1.8	RCC Box	194.339	194.339	-	-	-	195.989	0.350	0.150	196.489	203.276	204.018
23	6	89/958	-936.125	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	196.172	196.172	-	-	-	200.522	0.450	0.150	201.122	203.563	204.305
24	7	89/565	-521.528	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	195.839	195.839	-	-	-	200.189	0.450	0.150	200.789	204.124	204.866
25	8	Nil	-420.000	Balancing culvert		1x2x1.8	RCC Box	194.246	194.246	-	-	-	195.896	0.350	0.150	196.396	204.378	205.120
26	9	89/361	-320.542	RUB	1 x 4.7 x 5	1x5x5	RCC Box	197.134	197.134	-	-	-	201.984	0.600	0.150	202.734	204.627	205.369
27	10	89/361	-313.158	Canal	1 x 5.2 x 5	1x5x5	RCC Box	195.952	195.952	-	-	-	200.802	0.600	0.150	201.552	204.645	205.387
28	11	Nil	-94.000	Balancing culvert		1x2x1.8	RCC Box	193.119	193.119	-	-	-	194.769	0.350	0.150	195.269	205.193	205.935
29	12	88/750	252.641	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	195.246	195.246	-	-	-	199.596	0.450	0.150	200.196	206.060	206.802
30	13	88/010	1006.611	RUB	1 x 12 x 5.5	2x6x5.5	RCC Box	202.507	201.414	-	-	-	206.764	1.100	0.080	209.037	207.944	208.686
31	14	87/612	1225.934	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	203.797	203.797	-	-	-	208.147	0.450	0.150	208.747	208.808	209.550
32	15	87/180	1752.231	Canal	1 x 5.2 x 4.1	1x5x4	RCC Box	197.414	197.414	-	-	-	201.264	0.550	0.150	201.964	206.517	207.259
33	16	87/180	1762.730	RUB	1 x 5.2 x 4.1	1x6x4.5	RCC Box	197.520	197.520	-	-	-	201.870	0.650	0.150	202.670	206.464	207.206
35	17	86/700	2470.000	Balancing culvert	1 x 2 x 2	1x2x1.8	RCC Box	196.986	196.986	-	-	-	198.636	0.350	0.150	199.136	202.928	203.670
36	18	86/257	2791.333	RUB	1 x 12 x 5.5	2x6x5.5	RCC Box	196.781	196.769	-	-	-	202.119	0.650	0.150	202.931	202.919	203.661
37	19	85/320	3698.009	RUB	1 x 9.75 x 5.5	2x5x5.5	RCC Box	196.282	196.282	-	-	-	201.702	1.100	0.080	202.882	202.899	203.641
38	20	84/855	4176.783	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	195.707	195.707	-	-	-	200.057	0.450	0.150	200.657	202.558	203.300
39	21	84/821	4210.000	Balancing culvert	1 x 1.2 x 1.2	1x2x1.8	RCC Box	195.679	195.679	-	-	-	196.879	0.350	0.150	197.379	202.724	203.466
40	22	84/368	4658.299	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	199.980	199.980	-	-	-	204.330	0.450	0.150	204.930	204.966	205.708
41	23	83/940	5120.436	LHS	1 x 4 x 4.1	1x4x4	RCC Box	202.331	202.331	-	-	-	206.181	0.450	0.150	206.781	206.791	207.533
42	24	83/325	6005.000	Balancing culvert	1 x 3 x 3	1x3x3	RCC Box	197.377	197.377	-	-	-	200.227	0.350	0.150	200.727	203.728	204.470
43	25	82/860	6200.113	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	198.093	198.093	-	-	-	202.443	0.450	0.150	203.043	203.240	203.982
44	26	82/186	6879.781	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	197.204	197.204	-	-	-	201.554	0.450	0.150	202.154	202.278	203.020
45	27	81/987	7078.679	RUB	1 x 12 x 5.1	2x6x5.5	RCC Box	195.595	195.595	-	-	-	200.945	0.650	0.150	201.745	202.411	203.153
46	28	81/800	7305.000	Balancing culvert	1 x 2 x 2	1x2x1.8	RCC Box	192.703	192.703	-	-	-	194.353	0.350	0.150	194.853	202.562	203.304
47	29	81/717	7325.956	RUB	1 x 7 x 9.7	2x4x5.5	RCC Box	195.763	195.763	-	-	-	201.113	0.450	0.150	201.713	202.575	203.317
48	30	81/717	7342.865	Canal	1x16 + 1x10 + 1x16	3x12.2	PSC Slab	193.962	193.962	-	-	-	201.407	1.100	0.080	197.982	202.587	203.329

S.NO.	PRO BR. NO.	Exg chainage	PRO CHAINAGE	TYPE OF CROSSING	EXG Configuration	PROPOSED SPAN	PRO TYPE OF STRUCTURE	BL	REV BL	HFL	PCL	PFB	PSL	TOP SLAB THICKNESS	WEARING COAT	Min PFL req	PFL	PRL
49	31	81/717	7356.263	RUB	1 x 7 x 9.7	2x4x5.5	RCC Box	196.551	196.551	-	-	-	201.901	0.450	0.150	202.501	202.596	203.338
50	32	81/600	7600.000	Balancing culvert	1 x 2 x 2	1x2x1.8	RCC Box	193.239	193.239	-	-	-	194.889	0.350	0.150	195.389	201.608	202.350
51	33	81/468	7620.539	RUB	1 x 5 x 8.3	1x5x5	RCC Box	194.170	194.170	-	-	-	199.020	0.600	0.150	199.770	201.505	202.247
52	34	81/468	7643.164	Major	2 x 7.1 x 8.3	3x9.15	PSC Slab	192.921	192.921	195.687	4.815	5.705	200.502	0.830	0.060	197.345	201.392	202.134
53	35	81/161	7912.000	Field Channel	1 x 4 x 3	1x4x3	RCC Box	194.427	194.427	-	-	-	197.277	0.450	0.150	197.877	200.048	200.790
54	36	80/850	8240.000	Balancing culvert	1 x 4 x 3.7	1x2x1.8	RCC Box	193.676	193.676	-	-	-	195.326	0.350	0.150	195.826	198.408	199.150
55	37	80/479	8671.851	RUB	1 x 6 x 4.1	1x6x4.5	RCC Box	194.161	194.161	-	-	-	198.511	0.650	0.150	199.311	199.319	200.061
	38	80/175	8844.027	IOCL Pipeline	1x18	1x18.3	PSC I Girder	193.911	193.911	-	-	-	196.558	2.170	0.080	198.661	198.808	199.550
56	39	Nil	9055.000	Minor Bridge		1x9.15	PSC Slab	192.998	192.998	194.768	3.112	4.002	197.880	0.830	0.060	196.258	198.770	199.512
57	40	79/871	9175.000	Balancing culvert	1 x 1.2 x 1.2	1x2x1.8	RCC Box	192.856	192.856	-	-	-	194.056	0.350	0.150	194.556	199.370	200.112
58	41	79/867	9220.681	RUB	1 x 5 x 4.1	1x5x4.5	RCC Box	194.495	194.471	-	-	-	198.821	0.600	0.150	199.595	199.571	200.313
60	42	79/650	9410.700	Balancing culvert	1 x 2 x 2	1x3x3	RCC Box	193.378	193.378	-	-	-	196.228	0.350	0.150	196.728	199.048	199.790
59	43	79/306	9696.184	RUB	1 x 7.5 x 5.1	2x4x5.5	RCC Box	193.985	193.985	-	-	-	199.335	0.450	0.150	199.935	199.974	200.716
61	44	79/017	10024.343	RUB	1 x 12 x 5.1	2x6x5.5	RCC Box	194.249	194.249	-	-	-	199.599	0.600	0.150	200.349	200.363	201.105
62	45	78/827	10222.000	Balancing culvert	1 x 2 x 2	1x2x1.8	RCC Box	194.452	194.452	-	-	-	196.102	0.350	0.150	196.602	200.198	200.940
63	46	78/540	10521.633	RUB	1 x 4 x 4.1	1x4x4.5	RCC Box	195.467	195.467	-	-	-	199.817	0.450	0.150	200.417	201.646	202.388
64	47	78/334	10700.000	Balancing culvert	1 x 1.2 x 1.2	1x2x1.8	RCC Box	194.885	194.885	-	-	-	196.535	0.350	0.150	197.035	202.537	203.279
65	48	78/206	10849.391	Major RUB	1X9 + 1X15 + 1X2.5 + 1X9 + 1X15	2x30.5	PSC Box	195.873	195.873	-	-	-	201.377	1.310	0.000	202.683	202.687	203.429
66	49	Nil	11120.000	Balancing culvert		1x2x1.8	RCC Box	194.887	194.887	-	-	-	196.537	0.350	0.150	197.037	201.975	202.717
67	50	77/429	11619.391	RUB	1 x 4 x 4.8	1x4x5	RCC Box	195.309	195.276	-	-	-	200.126	0.450	0.150	200.759	200.726	201.468
68	51	77/388	11620.300	Canal	1 x 3.1 x 4.8	1x3x5	RCC Box	195.277	195.277	-	-	-	200.127	0.400	0.150	200.677	200.724	201.466
69	52		12125.000	Balancing culvert		1x2x1.8	RCC Box	194.721	194.721	-	-	-	196.371	0.350	0.150	196.871	199.462	200.204
70	53		12431.740	Field Channel		1x2x1.8	RCC Box	195.305	195.305	-	-	-	196.955	0.350	0.150	197.455	198.696	199.438
71	54		13220.000	Minor		1x3x3	RCC Box	194.860	194.860	197.311	0.399	1.026	197.710	0.350	0.150	198.311	198.337	199.079
72	55		13345.293	Minor		1x3x3	RCC Box	195.152	195.152	197.266	0.736	1.698	198.002	0.350	0.150	198.502	198.964	199.706
73	56		13493.000	Minor		1x3x3	RCC Box	195.066	195.066	197.311	0.605	2.391	197.916	0.350	0.150	198.416	199.702	200.444
74	57		13955.000	Major		2x24.4	PSC Girder	194.470	194.470	197.266	1.561	3.791	198.827	2.150	0.080	200.513	201.057	201.799
75	58		14066.514	RUB		1x5x5	RCC Box	195.452	195.452	-	-	-	200.302	0.600	0.150	201.052	201.057	201.799
76	59		14215.000	Balancing culvert		1x2x1.8	RCC Box	194.125	194.125	-	-	-	195.775	0.350	0.150	196.275	200.367	201.109
77	60		15460.000	Balancing culvert		1x2x1.8	RCC Box	193.701	193.701	-	-	-	195.351	0.350	0.150	195.851	199.172	199.914
78	61		15468.867	LHS		1x4x4	RCC Box	194.725	194.725	-	-	-	198.575	0.450	0.150	199.175	199.216	199.958
79	62		15477.570	Canal		1x3x1.8	RCC Box	194.078	194.078	-	-	-	195.728	0.350	0.150	196.228	199.260	200.002
80	63		16016.775	RUB		1x6x6	RCC Box	194.225	194.225	-	-	-	200.075	0.650	0.150	200.875	200.886	201.628
81	64		16312.205	Field Channel		1x4x2	RCC Box	192.438	192.438	-	-	-	194.288	0.400	0.150	194.838	199.569	200.311
82	65		16820.000	Balancing culvert		1x2x1.8	RCC Box	192.065	192.065	-	-	-	193.715	0.350	0.150	194.215	197.030	197.772
83	66		17378.000	Field Channel		1x2x1.8	RCC Box	192.158	192.158	-	-	-	193.808	0.350	0.150	194.308	194.443	195.185
84	67		18320.000	Balancing culvert		1x2x1.8	RCC Box	191.976	191.976	-	-	-	193.626	0.350	0.150	194.126	197.832	198.574
85	68		18592.617	RUB		2x5x5.5	RCC Box	192.629	192.629	-	-	-	194.479	1.151	0.080	195.710	199.195	199.937
86	69		19070.000	Balancing culvert		1x2x1.8	RCC Box	190.087	190.087	-	-	-	191.737	0.350	0.150	192.237	201.582	202.324
87	70		19604.000	Minor		1x4x2	RCC Box	191.275	191.275	192.987	0.138	11.265	193.125	0.450	0.150	193.987	204.252	204.994
88	71		20196.000	Field Channel		1x2x1.8	RCC Box	192.302	192.302	-	-	-	193.952	0.350	0.150	194.452	206.212	206.954
89	72		20365.634	RUB		1x5x5	RCC Box	193.480	193.480	-	-	-	198.330	0.600	0.150	199.080	206.354	207.096
90	73		20803.000	Major RUB		1x9.15	PSC Slab	194.506	194.506	-	-	-	207.591	0.830	0.060	201.396	208.481	209.223
91	74		20813.233	Canal		1x12.2	PSC Slab	193.838	193.838	-	-	-	207.352	1.100	0.080	196.189	208.532	209.274
92	75		20823.233	Major RUB		1x9.15	PSC Slab	194.705	194.705	-	-	-	207.692	0.830	0.060	201.595	208.582	209.324
93	76		20850.000	Balancing culvert		1x2x1.8	RCC Box	194.840	194.840	-	-	-	196.490	0.350	0.150	196.990	208.716	209.458
94	77		21112.000	Balancing culvert		1x2x1.8	RCC Box	196.378	196.378	-	-	-	198.028	0.350	0.150	198.528	210.026	210.768
95	78		21123.681	RUB		2x5x5	RCC Box	197.611	197.611	-	-	-	202.461	0.500	0.150	203.111	210.084	210.826

De – Tour from DFCC Alignment

S.NO.	PRO BR. NO.	Exg chainage	PRO CHAINAGE	TYPE OF CROSSING	EXG Configuration	PROPOSED SPAN	PRO TYPE OF STRUCTURE	BL	REV BL	HFL	PCL	PFB	PSL	TOP SLAB THICKNESS	WEARING COAT	Min PFL req	PFL	PRL
96	79		21200.000	Balancing culvert		1x2x1.8	RCC Box	196.760	196.760	-	-	-	198.410	0.350	0.150	198.910	210.466	211.208
97	80		21530.000	Minor		1x2x1.8	RCC Box	198.622	198.622	198.955	1.317	13.161	200.272	0.350	0.150	200.772	212.116	212.858
98	81		21790.000	Balancing culvert		1x2x1.8	RCC Box	202.168	202.168	-	-	-	203.818	0.350	0.150	204.318	213.416	214.158
99	82		22075.000	Minor		1x2x1.8	RCC Box	205.977	205.977	206.348	1.279	8.493	207.627	0.350	0.150	208.127	214.841	215.583
100	83		22270.000	Balancing culvert		1x2x1.8	RCC Box	208.626	208.626	-	-	-	210.276	0.350	0.150	210.776	215.816	216.558
101	84	Nil	27658.288	Aqueduct		1x18x96	Trough	262.710	238.716	264.918	-26.202	-22.994	238.716	0.600	0.150	265.918	241.924	242.666
102		97065	27996.872	Road to be diverted to ROB at ch:95985m	1X12 + 1X32 + 1X12		RCC Box	264.585	238.017	-	-	-	242.867	0.600	0.150	270.185	243.617	244.359
103		96800	28260.972	Road to be diverted to ROB at ch:95985m	1X4X2.5		RCC Box	264.928	238.810	-	-	-	243.660	0.600	0.150	270.528	244.410	245.152
104	85	95985	28827.274	ROB	1X7X3.5	3x24x	Composite Girder	264.106	264.106	-	-	-	271.373	1.470	0.080	-	245.825	246.567
105		94944	29991.218	Road to be diverted to ROB at ch:95985m	1x4x2.5		RCC Box	263.720	243.135	-	-	-	247.985	0.600	0.150	269.320	248.735	249.477
106		94347	30402.995	Road to be diverted to ROB at ch:95985m	1X10X5		RCC Box	263.764	244.265	-	-	-	249.115	0.500	0.150	269.264	249.765	250.507
107	86	93842	31020.000	Aqueduct	1X4X4.5	1x6x40	Trough	261.259	210.907	263.038	-12.281	-11.731	250.757	0.400	0.150	301.659	251.307	252.049
108		93200	31733.935	Road to be diverted to ROB at ch:32202.9236925	1x35	2x6x6	RCC Box	262.569	246.492	-	-	-	252.342	0.600	0.150	269.169	253.092	253.834
109	87	92800	32202.924	ROB	1X4X2.5	1+10 + 1x24 + 1x10	RCC Box	262.434	262.434	-	-	-	269.701	1.470	0.080	-	254.847	255.589
110		92249	32747.497	Road to be diverted to ROB at ch:32202.9236925	1X4X2.5	1x4x3.6	RCC Box	260.755	253.520	-	-	-	256.970	0.450	0.150	264.805	257.570	258.312
111	88	Nil	33400.000	Balancing culvert		1x2x1.8	RCC Box	252.497	252.497	-	-	-	254.147	0.350	0.150	254.647	260.832	261.574
112	89	91317	33710.757	RUB	1X10X5	2x5x5	RCC Box	256.791	256.791	-	-	-	261.641	0.500	0.150	262.291	262.294	263.036
113	90	Nil	34010.000	Balancing culvert		1x2x1.8	RCC Box	255.210	255.210	-	-	-	256.860	0.350	0.150	257.360	262.332	263.074
114	91	Nil	34920.000	Minor		2x6x3	RCC Box	256.803	256.803	259.214	0.439	2.218	259.653	0.550	0.150	260.353	261.432	262.174
115	92	90290, 89475	34966.011	LHS	1X4X2.5, 1X7X3.5	2x4x4	RCC Box	257.225	257.225	-	-	-	261.075	0.400	0.150	261.625	261.630	262.372
116	93	Nil	35560.000	Balancing culvert		1x2x1.8	RCC Box	255.186	255.186	-	-	-	256.836	0.350	0.150	257.336	258.732	259.474
117	94	88550	36402.578	LHS	1X4X2.5	1x4x3.6	RCC Box	254.628	254.628	-	-	-	258.078	0.600	0.150	258.828	258.828	259.570
118	95	Nil	36860.000	Balancing culvert		1x2x1.8	RCC Box	252.852	252.852	-	-	-	254.502	0.350	0.150	255.002	259.076	259.818
119	96	88130	36870.342	RUB	1X10X5	2x5x5	RCC Box	253.626	253.619	-	-	-	258.469	0.500	0.150	259.126	259.119	259.861
120	97	Nil	37090.000	Balancing culvert		1x2x1.8	RCC Box	252.585	252.585	-	-	-	254.235	0.350	0.150	254.735	258.146	258.888
121	98	86760	38012.640	LHS	1X4X3	1x4x4	RCC Box	253.711	253.711	-	-	-	257.561	0.450	0.150	258.161	259.469	260.211
122	99	Nil	38250.000	Balancing culvert		1x2x1.8	RCC Box	253.686	253.686	-	-	-	255.336	0.350	0.150	255.836	260.656	261.398
123	100	Nil	38760.000	Balancing culvert		1x2x1.8	RCC Box	255.350	255.350	-	-	-	257.000	0.350	0.150	257.500	262.526	263.268
124	101	86106	38834.320	LHS	1X7X3.5	2x4x4	RCC Box	256.137	256.137	-	-	-	259.987	0.400	0.150	260.537	262.712	263.454
125	102	84698	40281.547	RUB	1X10X5	2x5x5	RCC Box	258.446	258.446	-	-	-	263.296	0.500	0.150	263.946	266.330	267.072
126	103	Nil	40970.000	Balancing culvert		1x2x1.8	RCC Box	254.370	254.370	-	-	-	256.020	0.350	0.150	256.520	269.151	269.893
127	104	83/852	41051.682	Major	1x15	2x12.2	PSC Slab	252.840	252.840	253.651	14.728	15.908	268.379	1.100	0.080	255.431	269.559	270.301
128	105	Nil	41458.488	Balancing culvert		1x2x1.8	RCC Box	255.280	255.280	-	-	-	256.930	0.350	0.150	257.430	271.593	272.335
129	106	82684	42386.150	Major RUB	4x30	1x9.15 + 2x30.5 + 1x9.15	PSC Slab + Box Girder	267.764	267.764	-	-	-	273.776	2.100	0.000	275.864	275.876	276.618
130	107	Nil	43570.000	Balancing culvert		1x2x1.8	RCC Box	257.304	257.304	-	-	-	258.954	0.350	0.150	259.454	270.226	270.968
131	108	81440	43687.551	LHS	1x4x2.5	1x4x4	RCC Box	258.070	258.070	-	-	-	261.920	0.450	0.150	262.520	269.638	270.380
132	109	80797	44157.572	RUB	1X10X5	2x5x5	RCC Box	257.300	257.300	-	-	-	262.150	0.600	0.150	262.900	267.288	268.030
133	110	Nil	44690.000	Balancing culvert		1x2x1.8	RCC Box	254.887	254.887	-	-	-	256.537	0.350	0.150	257.037	264.626	265.368
134	111	79860	45234.759	LHS	1X4X2.5	1x4x4	RCC Box	254.930	254.930	-	-	-	258.780	0.450	0.150	259.380	261.902	262.644
135	112	79300	45662.105	LHS	1X4X3	1x4x4	RCC Box	255.648	255.648	-	-	-	259.498	0.450	0.150	260.098	260.099	260.841
136	113	Nil	45690.000	Balancing culvert		1x2x1.8	RCC Box	254.119	254.119	-	-	-	255.769	0.350	0.150	256.269	260.017	260.759
137	114	Nil	47305.231	Balancing culvert		1x2x1.8	RCC Box	248.589	248.589	-	-	-	250.239	0.350	0.150	250.739	254.061	254.803

S.NO.	PRO BR. NO.	Exg chainage	PRO CHAINAGE	TYPE OF CROSSING	EXG Configuration	PROPOSED SPAN	PRO TYPE OF STRUCTURE	BL	REV BL	HFL	PCL	PFB	PSL	TOP SLAB THICKNESS	WEARING COAT	Min PFL req	PFL	PRL
138	115	77585	47342.960	LHS	1X7X3.5	2x4x3.6	RCC Box	249.846	249.846	-	-	-	253.296	0.400	0.150	253.846	253.873	254.615
139	116	77116	47682.319	LHS	1X4X2.5	1x4x4	RCC Box	246.917	246.917	-	-	-	250.767	0.450	0.150	251.367	252.176	252.918
140	117	76520	48381.381	LHS	1X7X3.5	2x4x4	RCC Box	240.014	240.014	-	-	-	243.864	0.400	0.150	244.414	250.409	251.151
141	118	Nil	48510.000	Balancing culvert		1x2x1.8	RCC Box	240.075	240.075	-	-	-	241.725	0.350	0.150	242.225	250.088	250.830
142	119	Nil	49280.000	Balancing culvert		1x2x1.8	RCC Box	234.340	234.340	-	-	-	235.990	0.350	0.150	236.490	248.163	248.905
143	120	75325	49607.188	LHS	1X7X3.5	2x4x3.6	RCC Box	234.885	234.885	-	-	-	238.335	0.400	0.150	238.885	246.902	247.644
144	121	Nil	49920.000	Balancing culvert		1x2x1.8	RCC Box	231.598	231.598	-	-	-	233.248	0.350	0.150	233.748	245.338	246.080
145	122	Nil	50820.000	Balancing culvert		1x2x1.8	RCC Box	228.520	228.520	-	-	-	230.170	0.350	0.150	230.670	240.838	241.580
146	123	Nil	51260.000	Balancing culvert		1x2x1.8	RCC Box	228.388	228.388	-	-	-	230.038	0.350	0.150	230.538	238.638	239.380
147	124	76348.5	51320.301	RUB	3x22	2x6x6	RCC Box	228.853	228.853	-	-	-	234.703	0.600	0.150	235.453	238.336	239.078
148	125	Nil	51870.000	Balancing culvert		1x2x1.8	RCC Box	223.734	223.734	-	-	-	225.384	0.350	0.150	225.884	235.588	236.330
149	126	Nil	52513.000	Balancing culvert		1x2x1.8	RCC Box	218.904	218.904	-	-	-	220.554	0.350	0.150	221.054	232.988	233.730
150	127	72435	52553.668	RFO	1x35 + 1x34 + 1x35	1x18.3 + 1x45.7 + 1x18.3	PSC Girder + OWG	224.198	224.198	-	-	-	231.488	1.500	0.000	232.965	232.988	233.730
151	128	Nil	52894.000	Balancing culvert		1x2x1.8	RCC Box	217.407	217.407	-	-	-	219.057	0.350	0.150	219.557	231.818	232.560
152	129	71710	53104.988	LHS	1X4X3	1x4x4	RCC Box	218.456	218.456	-	-	-	222.306	0.450	0.150	222.906	230.763	231.505
153	130	Nil	53434.000	Balancing culvert		1x2x1.8	RCC Box	215.416	215.416	-	-	-	217.066	0.350	0.150	217.566	229.118	229.860
154	131	Nil	53680.000	Balancing culvert		1x2x1.8	RCC Box	216.928	216.928	-	-	-	218.578	0.350	0.150	219.078	227.888	228.630
155	132	Nil	54320.000	Balancing culvert		1x2x1.8	RCC Box	215.748	215.748	-	-	-	217.398	0.350	0.150	217.898	226.025	226.767
156	133	70476	54548.028	RUB	1X10X5	2x5x5	RCC Box	217.478	217.478	-	-	-	222.328	0.500	0.150	222.978	225.455	226.197
157	134	Nil	55330.000	Balancing culvert		1x2x1.8	RCC Box	216.913	216.913	-	-	-	218.563	0.350	0.150	219.063	223.500	224.242
158	135	68928	55921.822	RUB	1x35	2x6x6	RCC Box	219.374	218.697	-	-	-	224.547	0.600	0.150	225.974	225.297	226.039
159	136	Nil	56260.000	Balancing culvert		1x2x1.8	RCC Box	215.900	215.900	-	-	-	217.550	0.350	0.150	218.050	226.138	226.880
160	137	68184	56726.625	LHS	1X4X2.5	1x4x4	RCC Box	215.547	215.547	-	-	-	219.397	0.450	0.150	219.997	223.804	224.546
161	138	67910	57005.000	Balancing culvert	1X4X2.5	1x2x1.8	RCC Box	209.218	209.218	-	-	-	210.868	0.350	0.150	211.368	222.413	223.155
162	139	Nil	57707.000	Balancing culvert		1x2x1.8	RCC Box	210.269	210.269	-	-	-	211.919	0.350	0.150	212.419	219.473	220.215
163	140	Nil	58040.000	Balancing culvert		1x2x1.8	RCC Box	212.612	212.612	-	-	-	214.262	0.350	0.150	214.762	221.138	221.880
164	141	66385	58509.297	RFO	1x35 + 1x36.6 + 1x15 + 1x35 + 1x35	1x18.3 + 1x45.7 + 1x18.3	PSC Girder + OWG	213.977	213.977	-	-	-	221.263	1.500	0.000	222.744	222.763	223.505
165	142	Nil	58540.000	Balancing culvert		1x2x1.8	RCC Box	211.945	211.945	-	-	-	213.595	0.350	0.150	214.095	222.763	223.505
166	143	66466	58561.390	Major RUB	2x30 + 1x20 + 1x15 + 2x30	1x30.5	OWG	214.586	214.586	-	-	-	221.458	1.305	0.000	221.891	222.763	223.505
167	144	Nil	59150.000	Balancing culvert		1x2x1.8	RCC Box	213.117	213.117	-	-	-	214.767	0.350	0.150	215.267	221.596	222.338
168	145	65585	59169.755	LHS	1X7X3.5	2x4x4	RCC Box	214.112	214.112	-	-	-	217.962	0.400	0.150	218.512	221.523	222.265
169	146	Nil	59820.000	Balancing culvert		1x2x1.8	RCC Box	211.804	211.804	-	-	-	213.454	0.350	0.150	213.954	219.114	219.856
170	147	64500	60374.398	LHS	1X4X3	1x4x4	RCC Box	212.423	212.423	-	-	-	216.273	0.450	0.150	216.873	217.061	217.803
171	148	Nil	61060.000	Balancing culvert		1x2x1.8	RCC Box	209.702	209.702	-	-	-	211.352	0.350	0.150	211.852	216.930	217.672
172	149	63600	61320.834	LHS	1X4X2.5	1x4x4	RCC Box	212.788	212.788	-	-	-	216.638	0.450	0.150	217.238	217.479	218.221
173	150	63140	61735.764	LHS	1X7X3.5	2x4x4	RCC Box	213.314	213.314	-	-	-	217.164	0.450	0.150	217.764	217.825	218.567
174	151	Nil	62650.000	Balancing culvert		1x2x1.8	RCC Box	211.923	211.923	-	-	-	213.573	0.350	0.150	214.073	217.120	217.862
175	152	62200	62761.311	LHS	1x4x2.5	1x4x4	RCC Box	212.903	212.568	-	-	-	216.418	0.450	0.150	217.353	217.018	217.760
176	153	Nil	63020.000	Balancing culvert		1x2x1.8	RCC Box	211.924	211.924	-	-	-	213.574	0.350	0.150	214.074	216.028	216.770
177	154	Nil	63890.000	Balancing culvert		1x2x1.8	RCC Box	212.184	212.184	-	-	-	213.834	0.350	0.150	214.334	218.521	219.263
178	155	60900	64003.000	Balancing culvert	1x4x2.5	1x5x2	RCC Box	214.432	214.432	-	-	-	216.282	0.350	0.150	216.782	219.086	219.828
179	156	61089	64065.000	RUB	10x5	2x5x5	RCC Box	213.674	213.674	-	-	-	218.524	0.500	0.150	219.174	219.396	220.138
180	157	Nil	64140.000	Balancing culvert		1x2x1.8	RCC Box	213.011	213.011	-	-	-	214.661	0.350	0.150	215.161	219.321	220.063
181	158	Nil	64860.000	Balancing culvert		1x2x1.8	RCC Box	212.650	212.650	-	-	-	214.300	0.350	0.150	214.800	218.723	219.465
182	159	59874	65058.202	RUB	1X10X5	2x5x5	RCC Box	213.875	213.875	-	-	-	218.725	0.500	0.150	219.375	219.458	220.200
183	160	Nil	65793.000	Balancing culvert		1x2x1.8	RCC Box	212.433	212.433	-	-	-	214.083	0.350	0.150	214.583	217.158	217.900
184	161	58735	65898.564	LHS	1x4x2.5	1x4x3.6	RCC Box	213.094	213.094	-	-	-	216.544	0.450	0.150	217.144	217.264	218.006
185	162	Nil	66030.000	Balancing culvert		1x2x1.8	RCC Box	211.444	211.444	-	-	-	213.094	0.350	0.150	213.594	217.395	218.137

S.NO.	PRO BR. NO.	Exg chainage	PRO CHAINAGE	TYPE OF CROSSING	EXG Configuration	PROPOSED SPAN	PRO TYPE OF STRUCTURE	BL	REV BL	HFL	PCL	PFB	PSL	TOP SLAB THICKNESS	WEARING COAT	Min PFL req	PFL	PRL
186	163	Nil	66530.000	Balancing culvert		1x2x1.8	RCC Box	212.410	212.410	-	-	-	214.060	0.350	0.150	214.560	218.646	219.388
187	164	Br @ Ch:58130 is present in google earth but missing in KMP kml	66579.008	RUB		1x5x5	RCC Box	212.833	212.833	-	-	-	217.683	0.600	0.150	218.433	218.753	219.495
188	165	58279	66704.473	Major	2x40	2x30.5+1x9.15	PSC Slab	209.861	209.861	215.895	1.508	2.858	217.403	1.350	0.000	218.745	218.753	219.495
189	166	Nil	67170.000	Balancing culvert		1x2x1.8	RCC Box	211.389	211.389	-	-	-	213.039	0.350	0.150	213.539	218.619	219.361
190	167	57850	67183.670	LHS	1X7X3.5	2x4x4	RCC Box	212.153	212.153	-	-	-	216.003	0.450	0.150	216.603	218.608	219.350
191	168	Nil	67330.000	Balancing culvert		1x2x1.8	RCC Box	211.535	211.535	-	-	-	213.185	0.350	0.150	213.685	218.486	219.228
192	169	Nil	68320.000	Balancing culvert		1x2x1.8	RCC Box	212.214	212.214	-	-	-	213.864	0.350	0.150	214.364	217.661	218.403
193	170	56540	68550.651	LHS	1X4X3	1x4x4	RCC Box	212.889	212.889	-	-	-	216.739	0.450	0.150	217.339	217.469	218.211
194	171	Nil	69340.000	Balancing culvert		1x2x1.8	RCC Box	212.659	212.659	-	-	-	214.309	0.350	0.150	214.809	218.094	218.836
195	172	Nil	69920.000	Balancing culvert		1x2x1.8	RCC Box	210.452	210.452	-	-	-	212.102	0.350	0.150	212.602	220.994	221.736
196	173	Nil	70098.000	Field Channel		1x2x2	RCC Box	212.526	212.526	-	-	-	214.376	0.350	0.150	214.876	221.884	222.626
197	174	54554	70260.315	Major RUB	2x35	2x30.5	OWG	214.624	214.624	-	-	-	220.644	1.350	0.000	221.974	221.994	222.736
198	175	Nil	70340.000	Balancing culvert		1x2x1.8	RCC Box	211.357	211.357	-	-	-	213.007	0.350	0.150	213.507	221.994	222.736
199	176	Nil	70647.000	Balancing culvert		1x2x1.8	RCC Box	212.961	212.961	-	-	-	214.611	0.350	0.150	215.111	220.880	221.622
200	177	Nil	70919.000	Balancing culvert		1x2x1.8	RCC Box	213.670	213.670	-	-	-	215.320	0.350	0.150	215.820	222.219	222.961
201	178	Nil	71012.000	Balancing culvert		1x2x1.8	RCC Box	213.609	213.609	-	-	-	215.259	0.350	0.150	215.759	222.684	223.426
202	179	53720	71185.148	Major RUB	2X27.5	2x30.5	OWG	215.496	215.496	-	-	-	221.524	1.350	0.000	222.846	222.874	223.616
203	180	Nil	71270.000	Balancing culvert		1x2x1.8	RCC Box	213.432	213.432	-	-	-	215.082	0.350	0.150	215.582	222.874	223.616
204	181	Update Ch	71318.324	Canal		1x30.5	OWG	214.635	214.635	-	-	-	221.524	1.350	0.000	220.985	222.874	223.616
205	182	Not crossing KMP. Canal lies between prop alignment and KMP	71385.738	Canal		1x9.15 + 1x18.3+1x9.15	PSC Girder + PSC Slab	213.661	213.661	-	-	-	220.624	2.170	0.080	220.911	222.874	223.616
206	183		71420.000	Balancing culvert		1x2x1.8	RCC Box	212.475	212.475	-	-	-	214.125	0.350	0.150	214.625	222.874	223.616
207	184	Br @ Ch:58130 is present in google earth but missing in KMP kml	71764.365	LHS		2x4x4	RCC Box	213.283	213.283	-	-	-	217.133	0.450	0.150	217.733	221.602	222.344
208	185	Not crossing KMP.Canal lies between prop alignment and KMP	72210.000	Balancing culvert		1x2x1.8	RCC Box	213.492	213.492	-	-	-	215.142	0.350	0.150	215.642	219.375	220.117
209	186		72730.000	Balancing culvert		1x2x1.8	RCC Box	213.484	213.484	-	-	-	215.134	0.350	0.150	215.634	221.801	222.543
210	187		72928.774	Canal		2x9.15	PSC Slab	214.420	214.420	-	-	-	221.311	0.830	0.060	220.250	222.201	222.943
211	188	52209	72952.688	RUB	1X10X5	2x5x5	RCC Box	216.701	216.701	-	-	-	221.551	0.500	0.150	222.201	222.201	222.943
212	189	Not crossing KMP.Canal lies between prop alignment and KMP	73110.000	Balancing culvert		1x2x1.8	RCC Box	212.607	212.607	-	-	-	214.257	0.350	0.150	214.757	221.851	222.593
213	190		73650.000	Balancing culvert		1x2x1.8	RCC Box	211.444	211.444	-	-	-	213.094	0.350	0.150	213.594	219.151	219.893
214	191		73860.000	Balancing culvert		1x2x1.8	RCC Box	210.993	210.993	-	-	-	212.643	0.350	0.150	213.143	219.374	220.116
215	192		74380.000	Balancing culvert		1x2x1.8	RCC Box	213.566	213.566	-	-	-	215.216	0.350	0.150	215.716	221.974	222.716
216	193	50472	74410.260	Canal	1x10 + 1x28 + 1x10	2x5x5	RCC Box	216.551	216.551	-	-	-	221.401	0.500	0.150	222.051	222.125	222.867
217	194	Nil	74490.000	Balancing culvert		1x2x1.8	RCC Box	213.297	213.297	-	-	-	214.947	0.350	0.150	215.447	221.924	222.666
218	195	50472	74565.938	Canal	1x10 + 1x28 + 1x10	2x5x5	RCC Box	215.380	215.380	-	-	-	220.230	0.500	0.150	220.880	221.544	222.286
219	196	50705	74727.935	Canal & Road	1X10X5	1x12.2	PSC Slab	214.915	214.915	-	-	-	220.114	1.100	0.080	221.095	221.294	222.036
220	197	Nil	74890.000	Balancing culvert		1x2x1.8	RCC Box	212.178	212.178	-	-	-	213.828	0.350	0.150	214.328	221.402	222.144
221	198	49580	75365.171	LHS	1X4X2.5	1x4x4	RCC Box	214.594	214.594	-	-	-	218.444	0.450	0.150	219.044	222.028	222.770
222	199	Nil	75515.000	Balancing culvert		1x2x1.8	RCC Box	213.198	213.198	-	-	-	214.848	0.350	0.150	215.348	221.526	222.268
223	200	Nil	75870.000	Balancing culvert		1x2x1.8	RCC Box	213.504	213.504	-	-	-	215.154	0.350	0.150	215.654	220.338	221.080

S.NO.	PRO BR. NO.	Exg chainage	PRO CHAINAGE	TYPE OF CROSSING	EXG Configuration	PROPOSED SPAN	PRO TYPE OF STRUCTURE	BL	REV BL	HFL	PCL	PFB	PSL	TOP SLAB THICKNESS	WEARING COAT	Min PFL req	PFL	PRL
224	201	48985	75884.699	RUB	1X10X5	2x5x5	RCC Box	214.908	214.789	-	-	-	219.639	0.500	0.150	220.408	220.289	221.031
225	202	48492	76500.000	Balancing culvert	1X4X2.5	1x2x1.8	RCC Box	212.347	212.347	-	-	-	213.997	0.350	0.150	214.497	218.959	219.701
226	203	48058	76904.761	LHS	1X4X3	1x4x4	RCC Box	213.239	213.239	-	-	-	217.089	0.450	0.150	217.689	218.621	219.363
227	204	Nil	77224.000	Balancing culvert		1x2x1.8	RCC Box	212.806	212.806	-	-	-	214.456	0.350	0.150	214.956	218.355	219.097
228	205	Nil	78020.000	Balancing culvert		1x2x1.8	RCC Box	212.112	212.112	-	-	-	213.762	0.350	0.150	214.262	218.276	219.018
229	206	46800	78304.061	LHS	1X7X3.5	2x4x4	RCC Box	213.106	213.106	-	-	-	216.956	0.450	0.150	217.556	219.076	219.818
230	207	46476	78420.000	Balancing culvert	1X4X2.5	1x2x1.8	RCC Box	211.728	211.728	-	-	-	213.378	0.350	0.150	213.878	219.403	220.145
231	208	45934	78882.139	Major RUB	1x35	1x30.5	OWG	212.977	212.977	-	-	-	219.011	1.350	0.000	220.327	220.361	221.103
232	209	Nil	79290.000	Balancing culvert		1x2x1.8	RCC Box	211.168	211.168	-	-	-	212.818	0.350	0.150	213.318	218.961	219.703
233	210	44745	79598.141	LHS	1x7x3.5	2x4x4	RCC Box	212.194	212.194	-	-	-	216.044	0.450	0.150	216.644	217.420	218.162
234	211	45025	79921.892	Canal	1X30	3x9.15	PSC Slab	210.730	210.730	-	-	-	215.521	0.830	0.060	215.620	216.411	217.153
235	212	Nil	80380.000	Balancing culvert		1x2x1.8	RCC Box	210.729	210.729	-	-	-	212.379	0.350	0.150	212.879	214.761	215.503
236	213	44315	80827.204	Field Channel	1x4x2.5		RCC Box	211.580	211.580	-	-	-	214.430	0.450	0.150	215.030	215.997	216.739
237	214	Nil	80970.000	Balancing culvert		1x2x1.8	RCC Box	210.992	210.992	-	-	-	212.642	0.350	0.150	213.142	216.711	217.453
238	215	43573.189	81506.891	RUB	4X22	2x6x5	RCC Box	213.714	213.476	-	-	-	218.326	0.650	0.150	219.364	219.126	219.868
239	216	43100	81860.528	Balancing culvert	1X4X3	1x3x1.8	RCC Box	212.008	212.008	-	-	-	213.658	0.350	0.150	214.158	217.358	218.100
240	217	Nil	82030.000	Balancing culvert		1x3x3	RCC Box	211.384	211.384	-	-	-	214.234	0.350	0.150	214.734	216.511	217.253
241	218	42400	82073.179	LHS	1X4X2.5	1x4x3.6	RCC Box	212.126	212.126	-	-	-	215.576	0.400	0.150	216.126	216.299	217.041
242	219	Nil	82410.000	Balancing culvert		1x2x1.8	RCC Box	212.089	212.089	-	-	-	213.739	0.350	0.150	214.239	217.839	218.581
243	220	Nil	82660.000	Field Channel		1x2x2	RCC Box	213.134	213.134	-	-	-	214.984	0.350	0.150	215.484	219.089	219.831
244	221	Nil	82864.696	Balancing culvert		1x3x1.8	RCC Box	212.036	212.036	-	-	-	213.686	0.350	0.150	214.186	220.113	220.855
245	222	41460	82907.046	RUB	1X10X5	2x5x5	RCC Box	214.546	214.546	-	-	-	219.396	0.500	0.150	220.046	220.202	220.944
246	223	Nil	83170.000	Balancing culvert		1x2x1.8	RCC Box	212.617	212.617	-	-	-	214.267	0.350	0.150	214.767	219.983	220.725
247	224	40850	83611.799	LHS	1X4X2.5	1x5x5	RCC Box	212.255	212.255	-	-	-	217.105	0.450	0.150	217.705	219.614	220.356
248	225	Nil	83806.492	Balancing culvert		1x2x1.8	RCC Box	208.272	208.272	-	-	-	209.922	0.350	0.150	210.422	219.452	220.194
249	226	Nil	84390.000	Balancing culvert		1x2x1.8	RCC Box	209.889	209.889	-	-	-	211.539	0.350	0.150	212.039	218.966	219.708
250	227	Nil	85050.000	Balancing culvert		1x2x1.8	RCC Box	212.121	212.121	-	-	-	213.771	0.350	0.150	214.271	218.416	219.158
251	228	Nil	85730.000	Balancing culvert		1x3x2	RCC Box	212.762	212.762	-	-	-	214.612	0.350	0.150	215.112	220.291	221.033
252	229	38380	85758.000	Canal	3x33	2x30.5	OWG	213.692	213.692	-	-	-	218.941	1.350	0.000	220.042	220.291	221.033
253	230	38984	85872.783	RUB	1x35	2x6x6	RCC Box	213.766	213.641	-	-	-	219.491	0.650	0.150	220.416	220.291	221.033
254	231	Nil	86250.000	Balancing culvert		1x2x1.8	RCC Box	211.302	211.302	-	-	-	212.952	0.350	0.150	213.452	221.925	222.667
255	232		86890.000	Balancing culvert + LHS		1x2x1.8+1x4x3.6	RCC Box	211.403	211.403	-	-	-	214.853	0.450	0.150	215.453	224.900	225.642
256	233	37600	87138.390	LHS	1x4x2.5	1x4x4	RCC Box	213.462	213.462	-	-	-	217.312	0.450	0.150	217.912	226.055	226.797
257	234	36864	87583.000	Canal	2x21.753	1x3x3	RCC Box	212.164	212.164	-	-	-	215.014	0.350	0.150	215.514	228.121	228.863
258	235	Nil	87814.000	Balancing culvert		1x2x1.8	RCC Box	214.718	214.718	-	-	-	216.368	0.350	0.150	216.868	229.195	229.937
259	236	37057	87824.648	LHS	1X7X3.5	2x4x4	RCC Box	215.289	215.289	-	-	-	219.139	0.400	0.150	219.689	229.245	229.987
260	237	Nil	88365.000	Balancing culvert		1x2x1.8	RCC Box	215.290	215.290	-	-	-	216.940	0.350	0.150	217.440	231.756	232.498
261	238	Clover leaf junction	88631.826	Major RUB		1x30.5	OWG	225.507	225.507	-	-	-	231.080	1.350	0.000	232.357	232.430	233.172
262	239	Nil	88740.000	Balancing culvert		1x2x1.8	RCC Box	215.290	215.290	-	-	-	216.940	0.350	0.150	217.440	232.430	233.172
263	240	34985	89823.000	Canal & Road	3x25 + 38 + 25	3X24.4 + 1X30.5 + 1X24.4	Composite Girder	216.500	216.500	-	-	-	225.117	2.963	0.000	224.463	228.080	228.822
264	241	Nil	89960.000	Balancing culvert		1x2x1.8	RCC Box	213.529	213.529	-	-	-	215.179	0.350	0.150	215.679	228.080	228.822
265	242	Nil	90590.000	Balancing culvert		1x2x1.8	RCC Box	215.772	215.772	-	-	-	217.422	0.350	0.150	217.922	225.905	226.647
266	243	Nil	90942.000	Field Channel		1x3x3	RCC Box	216.806	216.806	-	-	-	219.656	0.350	0.150	220.156	224.255	224.997
267	244	33749	91063.999	RFO		1x18.3 + 1x30.5 + 1x18.3	PSC Girder + OWG	213.710	213.710	-	-	-	222.755	1.500	0.000	222.477	224.255	224.997
268	245	Br @ Ch:33474 is present in google earth but missing in KMP kml	91580.817	RUB		1x5x5	RCC Box	215.429	215.429	-	-	-	220.279	0.600	0.150	221.029	222.490	223.232

S.NO.	PRO BR. NO.	Exg chainage	PRO CHAINAGE	TYPE OF CROSSING	EXG Configuration	PROPOSED SPAN	PRO TYPE OF STRUCTURE	BL	REV BL	HFL	PCL	PFB	PSL	TOP SLAB THICKNESS	WEARING COAT	Min PFL req	PFL	PRL
269	246	32710	92212.410	LHS	1X7X3.5	2x4x4	RCC Box	218.263	218.263	-	-	-	222.113	0.400	0.150	222.663	223.734	224.476
270	247	31970	92837.381	LHS	1X4X3	1x4x4	RCC Box	213.728	213.728	-	-	-	217.578	0.450	0.150	218.178	221.166	221.908
271	248	31600	93187.000	Major	1x35	1x30.5	OWG	215.001	215.001	218.306	2.102	3.452	220.408	1.350	0.000	220.758	221.758	222.500
272	249	31364	93385.109	LHS	1X4X3	1x4x4	RCC Box	218.571	217.684	-	-	-	221.534	0.450	0.150	223.021	222.134	222.876
273	250	33305	93625.140	Canal	2x10+1x20.98	1x30.5	OWG	213.597	213.597	-	-	-	222.003	1.350	0.000	218.947	223.353	224.095
274	251	Nil	94180.000	Balancing culvert		1x2x1.8	RCC Box	212.817	212.817	-	-	-	214.467	0.350	0.150	214.967	224.617	225.359
275	252	30096	94506.531	RUB	1x10x5	2x5x5	RCC Box	219.704	219.704	-	-	-	224.554	0.500	0.150	225.204	225.228	225.970
276	253	Nil	94900.000	Balancing culvert		1x2x1.8	RCC Box	212.548	212.548	-	-	-	214.198	0.350	0.150	214.698	224.035	224.777
277	254	Nil	95430.000	Balancing culvert		1x2x1.8	RCC Box	213.068	213.068	-	-	-	214.718	0.350	0.150	215.218	222.427	223.169
278	255	28924	95958.320	LHS	1X7X3.5	2x4x4	RCC Box	216.422	216.422	-	-	-	220.272	0.400	0.150	220.822	222.324	223.066
279	256	28317	96250.593	Canal & Road	10+2x33+10	2x30.5	OWG	218.525	218.525	-	-	-	221.782	1.350	0.000	223.875	223.132	223.874
280	257	Nil	96560.000	Balancing culvert		1x2x1.8	RCC Box	216.079	216.079	-	-	-	217.729	0.350	0.150	218.229	222.657	223.399
281	258	Nil	97500.000	Balancing culvert		1x2x1.8	RCC Box	211.595	211.595	-	-	-	213.245	0.350	0.150	213.745	222.279	223.021
282	259	27745	97591.081	LHS	1X4X2.5	1x4x4	RCC Box	218.247	218.057	-	-	-	221.907	0.450	0.150	222.697	222.507	223.249
283	260	26480	98245.369	LHS	1X7X3.5	2x4x4	RCC Box	218.834	218.834	-	-	-	222.684	0.400	0.150	223.234	223.234	223.976
284	261	Nil	98900.000	Balancing culvert		1x2x1.8	RCC Box	217.190	217.190	-	-	-	218.840	0.350	0.150	219.340	221.934	222.676
285	262	25423	99366.418	LHS	1x7x3.5	2x4x4	RCC Box	219.225	219.225	-	-	-	223.075	0.400	0.150	223.625	223.856	224.598
286	263	25423	99372.000	Canal	1x10.6	1x6x3	RCC Box	219.254	219.254	-	-	-	222.104	0.600	0.150	222.854	223.830	224.572
287	264	25423	99380.863	LHS	1x4x2.5	1x4x3.6	RCC Box	219.679	219.679	-	-	-	223.129	0.450	0.150	223.729	223.787	224.529
288	265	Nil	10004.350	Balancing culvert		1x2x1.8	RCC Box	216.600	216.600	-	-	-	218.250	0.350	0.150	218.750	220.821	221.563
289	266	Nil	100430.000	Balancing culvert		1x2x1.8	RCC Box	214.745	214.745	-	-	-	216.395	0.350	0.150	216.895	218.825	219.567
290	267	23744	101015.294	RUB	1X10X5	2x5x5	RCC Box	212.191	212.191	-	-	-	217.041	0.500	0.150	217.691	217.768	218.510
291	268	Nil	101340.000	Balancing culvert		1x2x1.8	RCC Box	213.492	213.492	-	-	-	215.142	0.350	0.150	215.642	218.008	218.750
292	269	23340	101376.314	LHS	1X4X2.5	1x4x4	RCC Box	213.541	213.541	-	-	-	217.391	0.450	0.150	217.991	218.035	218.777
293	270	Nil	102040.000	Balancing culvert		1x2x1.8	RCC Box	214.504	214.504	-	-	-	216.154	0.350	0.150	216.654	216.688	217.430
294	271	Nil	103060.000	Balancing culvert		1x2x1.8	RCC Box	211.777	211.777	-	-	-	213.427	0.350	0.150	213.927	220.873	221.615
295	272	21214	103380.997	RUB	1X10X5	2x5x5	RCC Box	216.645	216.645	-	-	-	221.495	0.500	0.150	222.145	222.170	222.912
296	273	Nil	104230.000	Field Channel		1x2x2	RCC Box	219.100	219.100	-	-	-	220.950	0.350	0.150	221.450	224.951	225.693
297	274	20510	104306.977	LHS	1X4X2.5	1x4x4	RCC Box	220.552	220.552	-	-	-	224.402	0.450	0.150	225.002	225.047	225.789
298	275	19760	105054.348	LHS	1X4X3	1x4x4	RCC Box	219.122	219.122	-	-	-	222.972	0.450	0.150	223.572	223.602	224.344
299	276	19545	105160.000	Balancing culvert	1X4X2.5	1x2x1.8	RCC Box	216.616	216.616	-	-	-	218.266	0.350	0.150	218.766	223.735	224.477
300	277	18889	105680.000	Canal	1x3x3	1x3x3	RCC Box	220.258	220.258	-	-	-	222.108	0.350	0.150	222.608	224.794	225.536
301	278	18850	105902.579	LHS	1x4x3	1x4x4	RCC Box	219.576	219.576	-	-	-	223.426	0.450	0.150	224.026	225.247	225.989
302	279	Nil	106200.000	Balancing culvert		1x2x1.8	RCC Box	217.938	217.938	-	-	-	219.588	0.350	0.150	220.088	225.853	226.595
303	280	17928.74	106877.293	Major RUB	2X27.5	1x30.5	OWG	220.041	220.041	-	-	-	225.541	1.350	0.000	226.891	226.891	227.633
304	281	Nil	107328.600	Balancing culvert		1x2x1.8	RCC Box	213.156	213.156	-	-	-	214.806	0.350	0.150	215.306	225.748	226.490
305	282	16380	108393.796	LHS	1X7X3.5	2x4x4	RCC Box	217.307	217.307	-	-	-	221.157	0.400	0.150	221.707	221.803	222.545
306	283	15900	108870.247	LHS	1X4X2.5	1x4x4	RCC Box	214.168	214.168	-	-	-	218.018	0.450	0.150	218.618	220.634	221.376
307	284	15567	108894.760	Minor Bridge	1X4X4	1x12.2	PSC Slab	214.251	214.251	216.441	3.135	4.315	219.576	1.100	0.080	218.250	220.756	221.498
308	285	15137	109675.262	RUB	1x10x5	2x5x5	RCC Box	218.320	218.320	-	-	-	223.170	0.500	0.150	223.820	224.655	225.397
309	286	Nil	109720.000	Balancing culvert		1x2x1.8	RCC Box	216.896	216.896	-	-	-	218.546	0.350	0.150	219.046	224.582	225.324
310	287	14574	110150.000	Canal	1X3X1.5	1x3x3	RCC Box	220.982	220.982	-	-	-	223.832	0.350	0.150	224.332	224.939	225.681
311	288	14574	110201.000	Field Channel	1x4x2.5	1x3x3	RCC Box	220.490	220.490	-	-	-	223.340	0.350	0.150	223.840	224.875	225.617
312	289	13910	110637.700	Balancing culvert	1X4X3	1x2x1.8	RCC Box	216.144	216.144	-	-	-	217.794	0.350	0.150	218.294	224.329	225.071
313	290	Nil	111532.720	Balancing culvert		1x2x1.8	RCC Box	215.707	215.707	-	-	-	217.357	0.350	0.150	217.857	223.210	223.952
314	291	13250	111588.793	LHS	1X7X3.5	2x4x4	RCC Box	218.481	218.481	-	-	-	222.331	0.450	0.150	222.931	223.140	223.882
315	292	Nil	112230.000	Balancing culvert		1x2x1.8	RCC Box	219.316	219.316	-	-	-	220.966	0.350	0.150	221.466	225.256	225.998
316	293	12487	112377.862	RUB	1X10X5	2x5x5	RCC Box	220.302	220.302	-	-	-	225.152	0.500	0.150	225.802	225.979	226.721
317	294	Nil	112947.000	Balancing culvert		1x2x1.8	RCC Box	218.396	218.396	-	-	-	220.046	0.350	0.150	220.546	224.289	225.031
318	295	11490	113100.535	LHS	1X4X3	1x4x4	RCC Box	219.770	219.770	-	-	-	223.620	0.450	0.150	224.220	224.876	225.618
319	296	Nil	113580.000	Balancing culvert		1x2x1.8	RCC Box	218.879	218.879	-	-	-	220.529	0.350	0.150	221.029	225.154	225.896

S.NO.	PRO BR. NO.	Exg chainage	PRO CHAINAGE	TYPE OF CROSSING	EXG Configuration	PROPOSED SPAN	PRO TYPE OF STRUCTURE	BL	REV BL	HFL	PCL	PFB	PSL	TOP SLAB THICKNESS	WEARING COAT	Min PFL req	PFL	PRL
320	297	Nil	113605.676	LHS		1x4x4	RCC Box	220.202	220.202	-	-	-	224.052	0.450	0.150	224.652	225.282	226.024
321	298	Not parallel to KMP	113840.000	Balancing culvert	Not parallel to KMP	1x2x1.8	RCC Box	218.769	218.769	-	-	-	220.419	0.350	0.150	220.919	224.354	225.096
322	299		114670.843	LHS		1x4x4	RCC Box	219.938	219.938	-	-	-	223.788	0.450	0.150	224.388	227.899	228.641
323	300		114820.000	Balancing culvert		1x2x1.8	RCC Box	219.657	219.657	-	-	-	221.307	0.350	0.150	221.807	228.570	229.312
324	301	9475.8	115174.000	Canal	2x39.5	2x30.5	OWG	222.950	222.950	-	-	-	228.164	1.350	0.000	229.300	229.514	230.256
325	302	Not parallel to KMP	115192.211	LHS	Not parallel to KMP	1x4x4	RCC Box	223.736	223.736	-	-	-	227.586	0.450	0.150	228.186	229.514	230.256
326	303		115210.000	Canal		2x30.5	OWG	223.212	223.164	-	-	-	228.164	1.350	0.000	229.562	229.514	230.256
327	304		115904.000	Field Channel		1x2x2	RCC Box	219.326	219.326	-	-	-	221.176	0.350	0.150	221.676	227.247	227.989
328	305		116212.251	RUB		1x5x5	RCC Box	220.987	220.987	-	-	-	225.837	0.600	0.150	226.587	226.645	227.387
329	306		116320.000	Balancing culvert		1x2x1.8	RCC Box	219.811	219.811	-	-	-	221.461	0.350	0.150	221.961	226.453	227.195
330	307		116742.000	Balancing culvert		1x2x1.8	RCC Box	219.399	219.399	-	-	-	221.049	0.350	0.150	221.549	226.075	226.817
331	308		117397.060	RUB		2x5x5	RCC Box	223.380	222.893	-	-	-	227.743	0.500	0.150	228.880	228.393	229.135
332	309		117910.000	Balancing culvert		1x2x1.8	RCC Box	217.688	217.688	-	-	-	219.338	0.350	0.150	219.838	226.089	226.831
333	310		118594.000	Balancing culvert		1x2x1.8	RCC Box	218.196	218.196	-	-	-	219.846	0.350	0.150	220.346	222.761	223.503
334	311		118722.612	LHS		1x4x4	RCC Box	219.325	217.685	-	-	-	221.535	0.450	0.150	223.775	222.135	222.877
335	312		119428.825	RUB		2x5x5	RCC Box	219.771	213.198	-	-	-	218.048	0.500	0.150	225.271	218.698	219.440
336	313		119560.000	Balancing culvert		1x2x1.8	RCC Box	216.480	215.909	-	-	-	217.559	0.350	0.150	218.630	218.059	218.801
337	314		119827.757	RUB		1x5x5	RCC Box	217.062	211.156	-	-	-	216.006	0.600	0.150	222.662	216.756	217.498
338	315		119865.980	RUB		2x6x6	RCC Box	217.276	210.097	-	-	-	215.947	0.600	0.150	223.876	216.697	217.439
339	316		10935	119955.000		Major	3x30.5	3x18.3	PSC Girder	211.259	211.259	212.946	1.501	3.751	214.447	2.170	0.080	216.696

MANESAR TO PATLI STATION

S.NO.	PRO BR. NO.	PRO CHAINAGE	TYPE OF CROSSING	PROPOSED SPAN	PRO TYPE OF STRUCTURE	MIN. PFL	HFL	GL	NO. OF SPAN	SPAN	CLEAR HEIGHT	HT OF BOX	MIN REQ. CLEARANCE	TOP SLAB THICKNESS	WEARING COAT	PROPOSED ROAD LEVEL	Easting	Northing
1	1	464.823	RUB	1x5x5	RCC Box	225.157	-	219.56	1	5.00	4.85	5.00		0.600	0.150		682547.090	3143410.170
2	2	971.140	RUB	2x4x4	RCC Box	225.215	-	220.81	2	4.00	3.85	4.00		0.400	0.150		682987.471	3143659.944
3	3	1190.000	Balancing culvert	1x2x1.8	RCC Box	217.661	216.661	215.51	1	2.00	1.65	1.80	-	0.350	0.150		683191.86	3143733.56
4	4	1495.913	RUB	1x4x4	RCC Box	225.526	-	221.08	1	4.00	3.85	4.00		0.450	0.150		683497.194	3143730.141
5	5	2039.997	Balancing culvert	1x2x1.8	RCC Box	225.978	224.978	223.83	1	2.00	1.65	1.80		0.350	0.150		683983.07	3143512.12
6	6	2147.952	RUB	1x4x4	RCC Box	229.487	-	225.04	1	4.00	3.85	4.00		0.450	0.150		684055.450	3143432.134
7	7	2260.192	Major RUB	3x24.4	Composite Girder	235.432	-	226.47	3	24.40			6.000	2.963	0.000		684118.575	3143339.440
8	8	2689.996	Balancing culvert	1x2x1.8	RCC Box	229.825	228.825	227.67	1	2.00	1.65	1.80		0.350	0.150		684227.40	3142928.97
9	9	3013.426	RUB	1x5x5	RCC Box	229.355	-	228.61	1	5.00	4.85	5.00		0.600	0.150		684164.872	3142613.172
10	10	3619.998	Balancing culvert	1x2x1.8	RCC Box	232.363	231.363	230.21	1	2.00	1.65	1.80		0.350	0.150		683932.62	3142056.34
11	11	3970.495	RUB	1x4x4	RCC Box	231.872	-	231.27	1	4.00	3.85	4.00		0.450	0.150		683744.362	3141760.693
12	12	4691.005	Balancing culvert	1x2x1.8	RCC Box	234.013	233.013	231.86	1	2.00	1.65	1.80		0.350	0.150		683398.99	3141134.06
13	13	5001.602	RUB	2x4x4	RCC Box	235.680	-	235.13	2	4.00	3.85	4.00		0.400	0.150		683442.674	3140829.818
14	14	5323.017	Balancing culvert	1x2x1.8	RCC Box	237.106	236.106	234.96	1	2.00	1.65	1.80		0.350	0.150		683536.95	3140522.54

BADSA TO SULTANPUR STATION

S.NO.	PRO BR. NO.	PRO CHAINAGE	TYPE OF CROSSING	PROPOSED SPAN	PRO TYPE OF STRUCTURE	MIN. PFL	HFL	GL	NO. OF SPAN	SPAN	CLEAR HEIGHT	HT OF BOX	MIN REQ. CLEARANCE	TOP SLAB THICKNESSES	WEARING COAT	PROPOSED ROAD LEVEL	Easting	Northing
1	1	168.588	Balancing culvert	1x2x1.8	RCC Box	212.462	211.462	210.31	1	2.00	1.65	1.80	-	0.350	0.150		681450.59	3152032.01
2	2	862.947	RUB	1x4x4	RCC Box	216.927	-	212.48	1	4.00	3.85	4.00		0.450	0.150		681744.792	3151404.366
3	3	1415.339	Balancing culvert	1x2x1.8	RCC Box	214.061	213.061	211.91	1	2.00	1.65	1.80		0.350	0.150		681874.25	3150868.16
4	4	2082.545	RUB + Balancing culvert	1x4x4 + 1x2x1.8	RCC Box	218.244	-	213.79	1	4.00	3.85	4.00		0.450	0.150		681924.576	3150203.082
5	5	2087.263			RCC Box	216.193	215.193	214.04	1	2.00	1.65	1.80		0.350	0.150		681924.85	3150198.37
6	6	2385.994	RUB	1x4x4	RCC Box	218.057	-	213.61	1	4.00	3.85	4.00		0.450	0.150		681947.868	3149900.791
7	7	2583.191	Major RUB	2x24.4x	Composite Girder	223.608	-	214.64	2	24.40			6.000	2.963	0.000		682043.655	3149731.406
8	8	2779.995	Balancing culvert	1x2x1.8	RCC Box	214.626	213.626	212.48	1	2.00	1.65	1.80		0.350	0.150		682214.70	3149639.41
9	9	3690.767	RUB	1x5x5	RCC Box	218.146	-	217.40	1	5.00	4.85	5.00		0.600	0.150		683112.756	3149624.696

MANDOTHI TO ASAUDHA STATION

S.NO.	PRO BR. NO.	PRO CHAINAGE	TYPE OF CROSSING	PROPOSED SPAN	PRO TYPE OF STRUCTURE	MIN. PFL	HFL	GL	NO. OF SPAN	SPAN	CLEAR HEIGHT	HT OF BOX	MIN REQ. CLEARANCE	MIN REQ. FREEBOARD	TOP SLAB THICKNES S	WEARING COAT	PROPOSED ROAD LEVEL	Easting	Nothing
1	1	418.059	Balancing culvert	1x2x1.8	RCC Box	212.691	211.691	210.54	1	2.00	1.65	1.80	-	-	0.350	0.150		678428.33	3174490.05
2	2	1077.390	Balancing culvert	1x2x1.8	RCC Box	214.498	213.498	212.35	1	2.00	1.65	1.80	-	-	0.350	0.150		678756.71	3175060.94
3	3	1390.469	RUB	1x4x4	RCC Box	213.435	-	208.99	1	4.00	3.85	4.00			0.450	0.150		678871.85	3175351.70
4	4	1700.000	Balancing culvert	1x2x1.8	RCC Box	214.926	213.926	212.78	1	2.00	1.65	1.80	-	-	0.350	0.150		678973.97	3175658.69
5	5	1713.993	Major RUB	1x30x	Composite Girder	219.291	-	210.32	1	30.00			6.000		2.970	0.000		679032.66	3175841.77
6	6	1753.649	Canal	3x30.5	OWG	218.071	215.762	212.76	3	30.50			1.000	1.000	1.309	0.000		678985.08	3175696.78
7	7	2277.539	Balancing culvert	1x2x1.8	RCC Box	214.038	213.038	211.89	1	2.00	1.65	1.80	-	-	0.350	0.150		679167.43	3176187.22
8	8	2350.459	RUB	1x5x5	RCC Box	218.925	-	213.33	1	5.00	4.85	5.00			0.600	0.150		679199.58	3176252.67
9	9	2916.976	Balancing + culvert	1x2x1.8 +	RCC Box	2.150	1.150		1	2.00	1.65	1.80	-	-	0.350	0.150		679454.56	3176758.56
10	10	2918.292	RUB	1x5x5	RCC Box	220.438	-	214.84	1	5.00	4.85	5.00			0.600	0.150		679455.06	3176759.78
11	11	3410.995	Canal + RUB	1x6x4 + 1x4x4	RCC Box	220.101	218.451	215.45	1	6.00	3.85	4.00			0.650	0.150		679756.18	3177143.40
12	12	3416.195			RCC Box	219.923	-	215.47	1	4.00	3.85	4.00			0.450	0.150		679760.34	3177146.52
13	13	4380.000	Balancing culvert	1x2x1.8	RCC Box	215.902	214.902	213.75	1	2.00	1.65	1.80	-	-	0.350	0.150		680640.98	3177532.67
14	14	4960.003	Balancing culvert	1x2x1.8	RCC Box	216.502	215.502	214.35	1	2.00	1.65	1.80	-	-	0.350	0.150		681179.79	3177747.35
15	15	5440.006	Balancing culvert	1x2x1.8	RCC Box	216.959	215.959	214.81	1	2.00	1.65	1.80	-	-	0.350	0.150		681625.70	3177925.02
16	16	6301.999	Canal	1x24.4	PSC Slab	222.302	-	216.05	1	24.40					2.170	0.080		682199.98	3178502.85
17	17	6376.985	Major RUB	1x24.4+1x30.5	Composite Girder	230.019	-	221.05	1	30.00			6.000		2.970	0.000		682223.84	3178573.94
18	18	6645.000	Balancing culvert	1x2x1.8	RCC Box	216.785	215.785	214.63	1	2.00	1.65	1.80	-	-	0.350	0.150		682314.56	3178825.91
19	19	7329.053	RUB	1x4x4	RCC Box	220.462	-	216.01	1	4.00	3.85	4.00			0.450	0.150		682638.48	3179415.02
20	20	7385.330	Balancing culvert	1x2x1.8	RCC Box	217.963	216.963	215.81	1	2.00	1.65	1.80	-	-	0.350	0.150		682631.96	3179470.85

NEW PATLI TO PATLI STATION

S.NO.	PRO BR. NO.	PRO CHAINAGE	TYPE OF CROSSING	PROPOSED SPAN	PRO TYPE OF STRUCTURE	MIN. PFL	HFL	GL	NO. OF SPAN	SPAN	CLEAR HEIGHT	HT OF BOX	TOP SLAB THICKNES S	WEARING COAT	PROPOSED ROAD LEVEL	Easting	Northing
1	1	191.468	RUB	1x5x5	RCC Box	220.181	-	219.43	1	5.00	4.85	5.00	0.600	0.150		682540.75	3143426.58
2	2	695.052	RUB	2x4x4	RCC Box	221.406	-	220.86	2	4.00	3.85	4.00	0.400	0.150		682978.99	3143674.61
3	3	1170.000	Balancing culvert	1x2x1.8	RCC Box	223.744	222.744	221.59	1	2.00	1.65	1.80	0.350	0.150		683385.48	3143919.88
4	4	1270.487	RUB	2x5x5	RCC Box	221.157	-	220.51	2	5.00	4.85	5.00	0.500	0.150		683459.30	3143987.89
5	5	2514.554	RUB	1x5x5	RCC Box	217.529	-	216.78	1	5.00	4.85	5.00	0.600	0.150		683179.44	3145013.25
6	6	2729.000	Balancing culvert	1x2x1.8	RCC Box	218.714	217.714	216.56	1	2.00	1.65	1.80	0.350	0.150		683004.16	3145136.78
7	7	3110.199	Balancing culvert	1x2x1.8	RCC Box	217.924	216.924	215.77	1	2.00	1.65	1.80	0.350	0.150		682824.84	3145463.69
8	8	3349.672	RUB	2x5x5	RCC Box	217.775	-	217.12	2	5.00	4.85	5.00	0.500	0.150		682753.58	3145692.31
9	9	3791.275	RUB	1x4x4	RCC Box	220.502	-	216.05	1	4.00	3.85	4.00	0.450	0.150		682657.57	3146123.25
10	10	4118.358	Balancing culvert	1x2x1.8	RCC Box	219.001	218.001	216.85	1	2.00	1.65	1.80	0.350	0.150		682590.29	3146443.34

Component of Signaling, Operation & Maintenance and Miscellaneous

Table : Design Criteria for S&T, O&M

DESIGN ASPECT	DESIGN CRITERIA
Signal and Telecommunication	
Signal	Multi Aspect colour Light Signaling system (MACLS)
	Double distant in case the breaking distance is more than 1 km
	Point Operation - Electrical
	Point Locking - Running Lines - Clamp-lock type high thrust 220 mm Stroke Point Machine - Yard Lines - 143 stroke Normal Point Machine
	Point detection - Electrical
	Lock Detection – Yes
	Interlocking - Electronic
	Track Circuiting - DC Track circuits/ MSDAC depending upon site conditions
	Block Working - UFSBI Token less with BPAC/ Block Panel
	Note: The signaling shall be made suitable for 25 KV AC Traction.
Telecom	Optical Fiber Cable (OFC) with HDPE pipe Protection
	Control Communications to be provided at all stations and other Locations as per requirement
	Data communication infrastructure as per requirements
	Means of Emergency Control Communication (EC Sockets) signal to be provided
Electrification - To be provided as if the adjoining lines/ sections are being electrified	
	SP - One per 50 km of Route Length
	SSP - Two per 50 km of Route Length
	TSS with Associated Transmission Line - One at every 50 km of Route Length
	Tower wagon/ car & shed - One per 50 Route Km or 100 Track km. If new line is of less than 50 Route km or 100 Track km then, existing Tower car/ wagon may be utilized for maintenance etc.
	SCADA - if the number of Remote Terminal Units in existing SCADA is less than 50 & total number including that of new line does not exceed 50 then existing SCADA system shall be augmented otherwise new SCADA to be provided.
	Power Line crossings shall be as per the provisions of ACTM
	OHE shall be as per standard design of ACTM



HARYANA ORBITAL RAIL CORRIDOR FROM PALWAL TO SONIPAT
BY LINKING ASAOTI-PATLI-ASAUDAH -HARSANA KALAN STATIONS



DESIGN ASPECT	DESIGN CRITERIA
Mechanical	
	In case of POL/ Liquid consignments to be loaded, XR supervisor with the assistance of staff of NGR/ JV company, would be required for post loading check & assistance in loading. For them one room and store may be provided.
	In case of Steel loading, TR examination line with both side pathways to be provided along with one room and store for TXR staff.
	For loading of special consignments such as Ammonia, facility to be created in consultation with Zonal Railway.
	For detachment of sick wagons etc. one stabling spur of suitable length may be provided.
	-
	Watering arrangement sufficient for the longest coaching train to be operated in the section to be provided at any of the station if either the running time the last watering station is morethan 4 hrs. or the distance from last watering station is more than 125 km.

Annexure 2.8

WORK PROGRAM																																																																			
Sl.No	Month/Activity	Start	End	Year Time Period (Months)	2022												2023												2024												2025												2026												2027		
					Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
1	Land Acquisition (Gazette Notification for declaring HORC project as special Railway Project, Gazette Notification for nominating competent Authority for Land Acquisition, Preparation of Land Plans, Land schedules, Publication of 20(A) to 20(E) and till award of compensation)	I/P	Sep-21	3	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
2	General Consultancy Services for Haryana Orbital Rail Corridor (HORC) (REOI, RFP, Construction Phase and Operation & maintenance)	I/P	Mar-27	60+12	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
3	Consultancy Services for Environment & Social Impact Assessment (ESIA) Study	I/P	Sep-21	3	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
4	Consultancy Services for Environment & Social Monitoring	Oct-21	Dec-25	3+48	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
5	Shifting/ modification of overhead electrical power line crossing LT/HT upto 33 KV by underground cables and removal of other overhead electrical infringement/ utilities existing in the proposed alignment of HORC from Palwal to Sonipat in state of Haryana.	I/P	Apr-22	10	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
6	Package 1: Priority section: Earthwork, Bridges, Station Buildings and other miscellaneous Civil Engineering Works in Connection with laying of New BG Double Railway Line of HORC project from Km 46.5 to Km 52.5 and its connectivity from Manesar to Patli Railway Station of IR Network	Jul-21	Mar-23	6+15	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
7	Package 2 : Track Works from Km (-) 2.8 to Km 122 and its connectivities to IR network of HORC Project including procurement of rails, PSC sleepers, Switches and Crossings, all rail and sleeper fittings, supply of ballast, linking of track and including annual maintenance of track for a period of 1 year.	Aug-21	Dec-26	5+48+12	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
8	Package 3 : Electrification works from chainage -2.8 km to 122 km of HORC i.e. entire HORC and including all stations and connectivities including annual maintenance of OHE works, for a period of 1 year. The package shall exclude electrification works for yard remodelling of existing IR stations	Aug-21	Dec-26	5+48+12	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
9	Package 4 : Signalling and Telecommunication works from chainage -2.8 km to 122 km of HORC i.e. entire HORC and including all stations and connectivities including annual maintenance of signalling and telecom for a period of 1 year. The package shall exclude S&T works for yard remodelling of existing IR stations	Aug-21	Dec-26	5+48+12	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
10	Package 5: Construction of 03 Rail Flyovers (RFOs) over existing IR network and 05 Rail Flyovers over National Highway Crossings in connection with HORC project.	Sep-21	Sep-24	5+32	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		
11	Package 6: Construction of tunnel from 22.38 Km to 27.26 km of HORC Project	Sep-21	Feb-25	6+36	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar																		

Annexure 4.1

Migratory Bird and Migratory route of Sultanpur National Park Gurugram, Haryana

Bird Migration – Bird migration is the regular journey undertaken by many species of birds in a particular season.

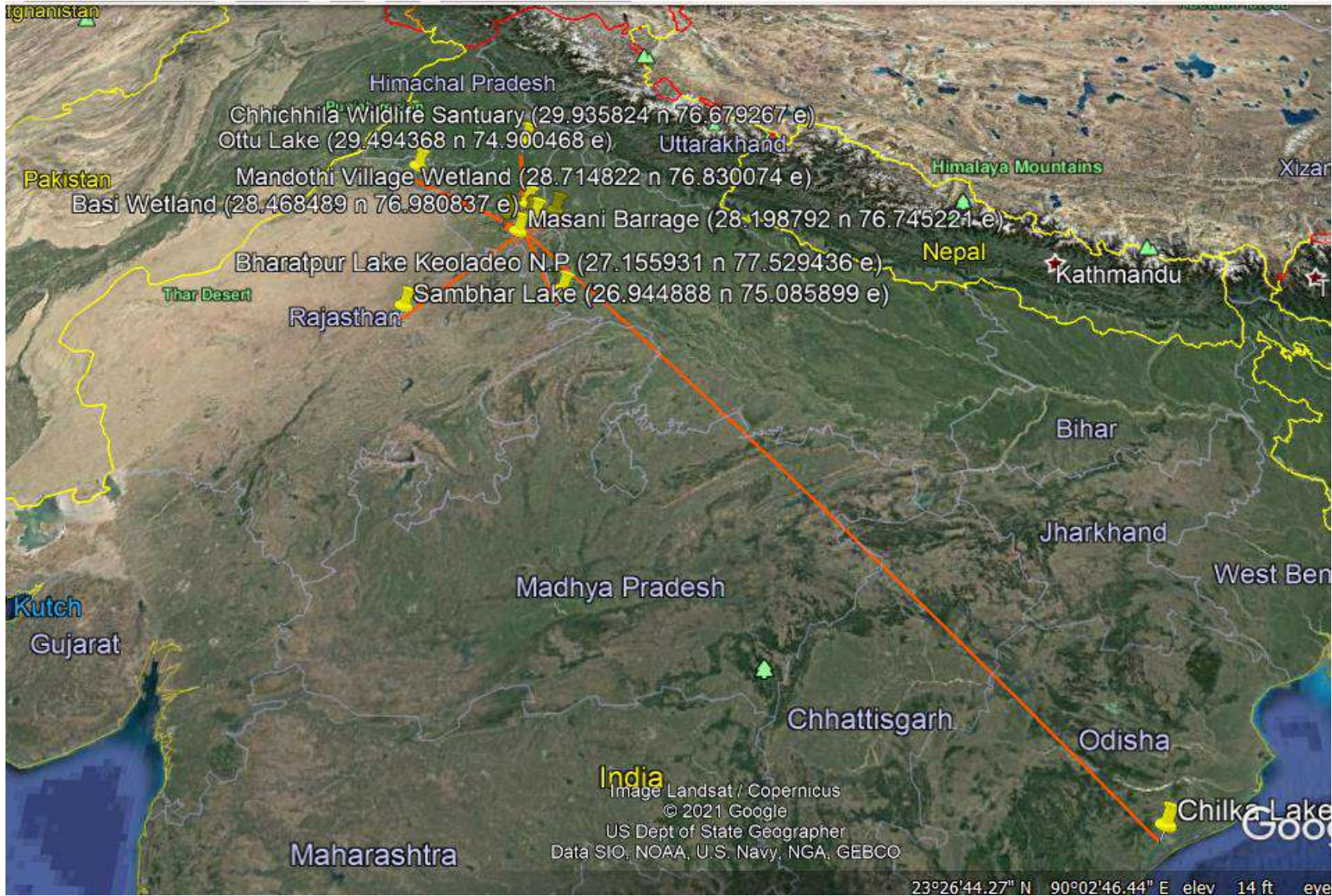
Why migration – Birds migrate because of harsh climate condition and shortfall in the availability of food. Birds migrate from breeding grounds to feeding/wintering grounds.

Time of migration – The most common pattern involves flying south in the autumn to feeding / wintering grounds and flying north in the spring from wintering grounds to breeding grounds in the temperate region. It means the birds migrate to Haryana from their breeding ground in temperate region during September – October with their hatchlings. Birds migrate back to their breeding grounds during February – March.

Haryana is a proud host of many species of migratory birds as well as resident birds. Birds mainly migrate from Europe, Central Asia, Siberia Etc. to Haryana. The local migration takes place in India in Chhichhila Wildlife Sanctuary, Ottu Lake, Mandhothi village lake, Bassi Wetland, Masani Barrage, Bharatpur lake, Sambhar lake, Chilka lake and Sultanpur Lake. There are number of places where migratory birds arrive in Haryana. More than 325 species of birds including about 90 long distance migrants have been recorded in the park. Scores of waders, ducks, storks, and raptors use the Central Asian Flyways. While a part of population stays in the Park, others after a few days rest and feeding take off again to different parts of the Peninsula. More than 45,000 birds congregate, whenever the monsoon is good and the lake fills up.

1. Lesser Whistling Duck- Resident
2. Ruddy Shelduck- South East Europe, East to lake Baikal, Mongolia, west china Etc.
3. Gadwall – Sub arctic northern Europe, and Asia.
4. Northern Shoveller – Northern Europe and Asia.
5. Northern Pintail – Northern Europe, Asia and Central Russia.
6. Common Teal - Northern Europe , Africa and Asia
7. Common Pochard – Western Europe, East through Central Asia to South Central Siberia and North China.
8. Ferruginous Duck – Western Europe to western Mongolia.
9. Glossy Ibis – North East and South India
10. Eurasian Spoonbill – South Spain, Holland, South East Europe to Central and East Asia .
11. Great Cormorant – Kazakhstan.
12. Osprey – South Asia.
13. Eurasian Coot – Central and Western Asia.
14. Pheasant Tailed Jacana – South China.
15. Black winger Stilt – Russia West Asia.
16. Pied Avocet – Europe Western Southern Central Asia.
17. Black Tailed Godwit – Western and Central Europe, Mongolia, North East China.

18. Common Redshank – North Scandinavia, Iberian Peninsula, Italy, Tunisia, Turkey, Siberia, Mongolia and Russia.
19. Marsh Sandpiper – Eastern Europe and Central Asia.
20. Brown Headed Gull – Coastal Asia, Tajikistan, Mongolia.
21. Eurasian Skylark – Europe.
22. Curlew – Baikal region and Siberia.
23. Mallard – Europe.
24. Demoiselle Crane – Europe and Central Asia.
25. Common Crane – Europe and Central Asia.
26. Tufted Duck – Baikal Lake and Asia.
27. White breasted Waterhen- Iceland, Scotland, Siberia.
28. Barheaded Goose – Baikal Lake and Central Asia.
29. Garganey - Europe.
30. Graylag Goose – Europe, Siberia.



Local Migratory Route



International Migratory Route

Census of Bird, Sultanpur National Park

S.No	Name of Bird	Scientific Name of Bird	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Average
1	Sarus Crane	<i>Grus antigones</i>	4	6	4	5	4	6	10	5
2	Green Pigeon	<i>Treron phoenicoptera</i>	110	130	148	120	119	73	350	117
3	Indian Eagle Owl	<i>Bubo nipacensis</i>	1	1	0	1	1	1	2	1
4	Common Myna	<i>Acridothered tristis</i>	165	168	204	184	182	187	220	182
5	Peacock	<i>Pavo cristatus</i>	122	127	120	60	56	73	110	93
6	Asian Koel	<i>Eudynamys scolopacea</i>	7	9	10	4	6	63	10	17
7	Black Francolin	<i>Francolinus francolinus</i>	4	6	2	2	4	4	4	4
8	Grey Francolin/Grey Partridge	<i>Francolinus pondicerianus</i>	313	280	182	170	232	220	252	233
9	Painted Francolin/Painted Partridge	<i>Francolinus pictus</i>	2	4	2	0	0	2	0	2
10	Jungle Bushquail	<i>Perdica asiatica</i>	62	60	57	55	75	61	53	62
11	Rock Bushquail	<i>Perdica argoodah</i>	2	0	0	2	0	4	0	1
12	Red Spurfowl	<i>Galloperdix spadicea</i>	0	0	0	0	0	1	0	0
13	Red Jungle Fowl	<i>Gallus gallus</i>	0	0	0	0	0	0	0	0
14	Rain Quails	<i>Coturnix coromandelica</i>	41	56	55	47	47	0	160	41
15	Small Buttonquail (Little bustard quail)	<i>Turnix sylvatica</i>	190	203	164	167	190	0	196	152
16	Barred Buttonquail (Common bustard quail)	<i>Turnix suscitator</i>	407	328	300	237	230	0	361	250
17	Ruddy Shelduck (Brahminy duck)	<i>Tedorna ferruginea</i>	401	370	350	415	372	0	278	318
18	Lesser Whistling Shelduck	<i>Dendrocygna javanica</i>	515	204	376	194	204	1735	172	538
19	spot-billed Duck	<i>Anas poecilorhyncha</i>	314	346	175	274	372	165	378	274
20	Northern Pintail	<i>Anas acuta</i>	22703	19701	17084	14071	13072	754	1279	14564
21	Redcrested Pochard	<i>Netta rufina</i>	21	71	65	27	45	34	12	44
22	Barheaded Goose	<i>Anser indicus</i>	19274	11204	15072	25051	17018	434	2278	14676
23	Common Teal	<i>Anas crecca</i>	21205	17073	12054	13042	11500	2410	9805	12881
24	Shoveller	<i>Anas clypeata</i>	7006	2310	5600	7700	7500	2706	2259	5470
25	Eurasian Wryneck	<i>Jynx torquilla</i>	12	10	6	7	5	8	10	8
26	Rufous Woodpecker	<i>Celeus brachyurus</i>	2	1	2	2	3	3	0	2
27	Browncapped Pigmy Woodpecker	<i>Dendrocopos nanus</i>	10	8	7	4	5	6	0	7
28	Yellow-crowned Woodpecker	<i>Dendrocopos mahrattensis</i>	6	4	6	4	6	13	4	7
29	Black-rumped woodpecker	<i>Dinopium benghalensis</i>	17	14	12	7	8	19	21	13
30	White-naped woodpecker	<i>Chrysocolaptes festivus</i>	0	0	0	0	0	0	0	0
31	Lesser Yellownape	<i>Picus chlorolophus chlorigaster</i>	4	5	5	5	4	5	0	5
32	Brown-headed Barbet	<i>Megalaima zeylanica</i>	42	31	18	15	17	17	22	23
33	Coppersmith Barbet	<i>Megalaima haemacephala</i>	28	20	17	12	10	77	58	27
34	Indian Grey Hornbill	<i>Ocyrceros birostitis</i>	6	6	6	5	4	5	8	5
35	Malabar Pied Hornbill	<i>Anthraceroceros coronatus</i>	0	0	0	0	0	1	0	0
36	Common Hoopoe	<i>Upupa epops</i>	167	83	52	55	47	173	193	96
37	Indian Roller	<i>Coracias benghalensis</i>	19	137	120	130	38	65	36	85
38	Common Kingfisher	<i>Alcedo atthis</i>	59	172	74	26	10	13	2	59

S.No	Name of Bird	Scientific Name of Bird	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Average
39	White-throated Kingfisher	<i>Halcyon smyrnesis</i>	67	107	59	127	39	37	47	73
40	Stork-billed Kingfisher	<i>Halcyon capensis</i>	2	2	0	2	2	2	0	2
41	Pied Kingfisher	<i>Ceryle rudis</i>	37	39	44	23	2	2	6	25
42	Lesser pied Kingfisher	<i>Ceryle lugubris</i>	3	6	7	5	2	5	0	5
43	Blue-bearded Beeeater	<i>Nyctornis athertoni</i>	320	421	51	63	66	173	84	182
44	Green Bee-eater	<i>Merops apiaster</i>	758	720	621	451	214	713	844	580
45	Pied Cuckoo	<i>Clamator jacobinus</i>	5	6	4	8	7	1	60	5
46	Common Hawk Cuckoo/Brain Fever Bird	<i>Hierococcyx varius</i>	5	5	6	7	5	4	4	5
47	Indian Cuckoo	<i>Cuculus micropetrus</i>	43	45	107	67	53	44	10	60
48	Lesser Cuckoo	<i>Cuculuc poliocephalus</i>	12	11	10	11	10	12	0	11
49	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	41	32	34	64	62	17	0	42
50	Banded Baycuckoo	<i>Cacomantis sonnerratii</i>	10	5	3	7	6	7	2	6
51	Sirkeer Malkoha	<i>Phaenicophaeus leschenaultii</i>	2	2	2	2	2	2	2	2
52	Greater Coucal	<i>Centropus sinesis</i>	17	19	47	57	40	13	2	32
53	Euresian Cuckoo	<i>Cuculus canorus</i>	12	14	77	78	102	43	17	54
54	Alexandrine Parakeet	<i>Pistaculca eupatria</i>	121	77	78	81	54	13	110	71
55	Plum-headed Parakeet	<i>Pistaculca cyanocephala</i>	61	64	82	88	120	173	78	98
56	Indian Lorikeet	<i>Loriculus vernalis</i>	36	35	40	39	50	51	4	42
57	Alpine Swift	<i>Tachymarptis melba</i>	5	6	7	3	8	8	0	6
58	Crested Tree Swift	<i>Hemiprocnec coronata</i>	320	304	402	163	181	167	56	256
59	house Swift	<i>Apus affinis</i>	266	306	215	176	252	198	202	216
60	White-rumped needletail	<i>Zoonavena</i>	191	363	181	320	113	271	176	240
61	Collared Scops Owl	<i>Otus bakkamoena</i>	15	2	117	8	17	68	4	38
62	Brown Fish Owl	<i>Ketupa zeylonensis</i>	2	2	1	2	2	2	2	2
63	Mottled Wood Owl	<i>Strix ocellata</i>	2	2	2	2	2	2	2	2
64	Eurasian Eagle Owl	<i>Bubo bubo</i>	2	0	2	0	2	2	2	2
65	Brown Hawk Owl	<i>Ninox scutulata</i>	2	12	11	8	11	13	2	10
66	Forest eagle owl/Spot Bellied Eagle Owl	<i>bubo nepalensis</i>	2	2	2	2	2	2	0	2
67	Spotted Owlet	<i>Athene brama</i>	36	32	30	30	36	37	42	5700
68	Jungle Owlet	<i>Glaucidium radiatum</i>	2	2	2	2	2	2	0	2
69	Indian Nightjar	<i>Caprimulgus asiaticus</i>	1	1	1	1	1	1	2	1
70	Savanna Nightjar	<i>Caprimulgus affinis</i>	1	1	1	1	1	1	2	1
71	Grey Nightjar	<i>Caprimulgus indicus</i>	0	2		2	2	2	0	2
72	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	181	31	30	32	36	14	8	62
73	Laughing Dove	<i>Streptopelia senegalensis</i>	170	182	187	180	182	184	208	181
74	Spotted Dove	<i>Streptopelia chinensis</i>	188	187	114	112	110	115	98	138
75	Eurasian Collared Dove	<i>streptopelia decaocto</i>	181	167	156	143	204	171	218	170
76	Emerald Dove	<i>Chalcophaps indica</i>	4	4	4	4	4	4	4	4
77	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	213	131	164	165	166	177	176	169

S.No	Name of Bird	Scientific Name of Bird	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Average
118	Marsh Harrier	<i>Circus melanoleucos</i>	36	34	35	36	37	31	30	35
119	Peregrine Falcon/Saheen Falcon	<i>Falco peregrinus</i>	2	2	2	2	2	2	4	2
120	Common Kestrel(European Kestrel)	<i>Falco tinnunculus</i>	14	16	15	8	15	17	12	14
121	Little Grebe	<i>Tachybaptus ruficollis</i>	79	72	71	69	67	117	122	79
122	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	168	167	166	145	140	167	186	159
123	Little Cormorant	<i>Phalacrocorax niger</i>	49	47	131	31	30	32	132	53
124	Darter	<i>Anhinga melanogaster</i>	29	27	25	26	27	28	34	27
125	Little Egret	<i>Egretta garzetta</i>	281	187	88	81	82	86	76	134
126	Intermediate Egret	<i>Mesophoyx intermedia</i>	73	74	70	71	72	74	60	72
127	Great Egret	<i>Casmerodius albus</i>	18	16	17	16	17	18	21	17
128	Cattle Egret	<i>Bubulcus ibis</i>	86	86	85	81	75	76	168	82
129	Indian Pond Heron	<i>Ardeola grayii</i>	14	15	16	17	19	18	22	17
130	Grey Heron	<i>Ardea cinerea</i>	58	72	74	71	28	29	47	55
131	Purple Heron	<i>Ardea purpurea</i>	19	29	63	39	38	13	38	34
132	Little Heron	<i>Butorides striatus</i>	24	21	18	14	15	16	0	18
133	Black-Crowned Night Heron	<i>Nycticorax nycticorax</i>	81	65	64	48	50	57	60	61
134	Glossy Ibis	<i>Plegadis falcinellus</i>	53	28	26	27	30	31	84	33
135	Spoonbill	<i>Platalea leucordia</i>	42	77	61	65	86	66	94	66
136	Black-Headed Ibis	<i>Threskiornis melanocephalus</i>	31	35	36	37	38	39	57	36
137	Black Ibis	<i>Pseudibis papillosa</i>	21	22	16	17	18	19	32	19
138	Wolly-necked stork(White necked Stork)	<i>Ciconia episcopus</i>	2	2	2	2	2	2	62	2
139	Asian Openbill (Open billed stork)	<i>Anastomus oscitans</i>	71	75	32	37	66	76	74	60
140	Black Stork	<i>Ciconia nigra</i>	4	0	4	0	2	0	0	0
141	Painted Stork	<i>Mycteria bucocephala</i>	402	535	431	620	631	506	788	788
142	Black Necked Stork	<i>Ephippiorynchus asiaticus</i>	2	2	2	2	2	2	8	2
143	Lesser Adjutant	<i>Leptotilis adjutant</i>	0	0	0	0	0	0	0	0
144	Indian Pitta	<i>Pitta brachyura</i>	1	1	1	0	2	4	2	2
145	Common lora	<i>Hypothymis azurea</i>	2	2	2	2	2	2	0	2
146	Blue-winged leafbird	<i>Chloropsis cochinchinensis</i>	13	11	17	10	11	12	2	12
147	Bay-backed Shrike	<i>Lanius vittatus</i>	52	62	64	81	55	77	42	65
148	Long-tailed Shrike (Rufousbacked shrike)	<i>Lanius schach</i>	11	12	14	15	16	17	35	14
149	Brown Shrike	<i>Lanius cristatus</i>	4	4	5	5	4	5	8	5
150	Southern Grey shrike	<i>Lanius Meridionalis</i>	6	6	6	6	6	6	16	6
151	Rufous Treepie (Indian Treepie)	<i>Dendrocitta vagabunda</i>	53	57	58	54	75	19	37	53
152	House Crow	<i>Corvus splendens</i>	177	178	177	204	214	177	256	188
153	Jungle Crow	<i>Corvus macrorhynchos</i>	169	173	172	179	180	187	13	177
154	Eurasian Golden Oriole	<i>Oriolus oriolus</i>	32	35	33	32	29	30	34	32
155	Black-Hooded Oriole	<i>Oriolus xanthornus</i>	5	5	5	5	5	5	2	5
156	Large Cuckooshrike	<i>coracina macei</i>	18	17	14	15	17	18	2	17

S.No	Name of Bird	Scientific Name of Bird	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Average
236	Blackheaded Yellow Bulbul	<i>Pynonotus melanicterus</i>	52	51	49	39	37	39	2	45
237	Ashy-crowned Sparrow Lark	<i>Erimopterix grisea</i>	14	12	15	18	17	17	197	16
238	Rufous-Tailed Lark	<i>Ammomanes phoenicurus</i>	98	181	109	110	112	115	0	121
239	32	<i>Alauda gulgula</i>	37	30	31	32	36	37		34
240	Redwinged Bush Lark/Indian Bush Lark	<i>Mirafra erythroptera</i>	65	159	164	131	120	117	111	114
241	Crested Lark/syke Lark	<i>Galerida deva</i>	105	34	32	64	37	32	146	51
242	Thick-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	18	11	10	6	7	7	0	10
243	Pale-billed Flowerpecker	<i>Dicaeum agile</i>	2	2	2	2	2	2	2	2
244	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	31	27	19	18	11	23	2	22
245	Purple Sunbird	<i>Nectarinia asiatica</i>	31	33	32	18	17	18	37	25
246	House Sparrow	<i>Passer domesticus</i>	94	92	81	87	76	77	120	85
247	Baya Weaver	<i>Ploceus philippinus</i>	61	64	81	82	87	88	384	77
248	Streaked weaver	<i>Ploceus manyar</i>	19	17	16	15	17	18	36	17
249	Red Avadavat	<i>Amandava amandava</i>	34	31	32	31	37	38	61	34
250	Indian Silverbill	<i>Lonchura malabarica</i>	120	117	92	98	99	103	76	105
251	White-rumped Munia	<i>Lonchura striata</i>	14	10	31	13	9	10	6	15
252	Scaly-breasted Munia (Spotted munia)	<i>Lonchura punctulata</i>	21	28	35	33	32	32	41	30
253	Green Munia	<i>Estrilda formosa</i>	4	4	4	4	4	4	0	4
254	Blackheaded munia	<i>Lonchura malaeca</i>	3	5	5	4	5	5	11	5
255	Common Rosefinch	<i>Carpodacus erythrinus</i>	9	10	11	12	13	14	2	12
256	Crested Bunting	<i>Melophus lathami</i>	2	2	2	2	2	2	4	2
257	Grey-necked Bunting	<i>Emberiza buchanani</i>	16	181	98	117	111	113	0	106
258	Black-headed Bunting	<i>Emberzia melanocephala</i>	5	2	2	2	2	2	0	2
259	Grey Wagtail	<i>Motacila cinerea</i>	49	52	51	58	59	63	16	55
260	White-browed Wagtail (Large Pied wagtail)	<i>Motacilla madresapatensis</i>	15	16	17	18	19	30	47	19
261	White Wagtail	<i>Motacilla alba</i>	106	107	112	111	110	117	246	111
262	Citrine Wagtail (Yellow headed Wagtail)	<i>Motacilla citreola</i>	107	77	86	85	80	81	269	86
263	Yellow Wagtail	<i>Motacilla flava</i>	181	176	54	132	72	76	406	115
264	Paddyfield Pipit	<i>Anthus rufulus</i>	129	127	125	120	36	37	134	96
265	Tree Pipit	<i>Anthus trivialis</i>	2	2	2	2	2	2	105	2
266	Olive-backed Pipit	<i>Anthus hodgsoni</i>	11	18	17	13	14	15	40	15
267	Long-billed Pipit	<i>Anthus similis</i>	2	2	2	2	2	2	60	2
268	chestnut-billed Sandgrosue (Indian Sandgrosue)	<i>Pterocles exustus</i>	25	17	15	18	13	18	40	18
269	Painted Sandgrouse	<i>Pterocles indicus</i>	4	4	4	4	4	4	6	4
270	Ashy Woodswallow	<i>Artamus fuscus</i>							0	0
271	Oriental White-eye	<i>Zosterops palpebrosus</i>	10	117	111	117	121	131	216	101
272	Fulvous whistling duck	<i>Dendrocygna Bicolour</i>	2970	1814	3405	3100	2700	2013	16	2667
273	Leser whjstling duck	<i>Dendrocygna javanica</i>	121	120	811	112	710	720	226	432
274	comb duck	<i>Sarkiodiornis melanotos</i>	166	164	181	176	177	178	269	174
275	Gadwall	<i>Anas strepa</i>	2081	764	1711	1720	2911	1620	2015	1801

S.No	Name of Bird	Scientific Name of Bird	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Average
316	Golden fronted leaf bird	<i>Chloropsis aurifons</i>	7		7	7	7	7	0	7
317	Ruff	<i>Philomachus pugnax</i>	1134	1361	1631	1620	1163	420	2046	1222
318	Greater Flamingo		2501	2099	1966	1894	1567	1366	1422	
319	Eurasian Curlew		71	51	46	22	46	55	28	
320	Leasser White Fronted Goose		7	3	4	9	8	6	6	
321	Golden Plover		96	84	52	74	44	88	60	
322	Imperial Eagle		9	3	6	5	4	4	4	
323	Forest Wegtail		0	0	0	0	2	1	1	1
324	Grey leg Goose		810	729	689	653	489	546	744	
325	Red Brested Flycatcher		81	74	67	59	43	56	62	
326	Whimbrel		0	0	0	0	0	1	2	
			102785	114287	82045	90498	77408	33665		

From

The Director,
Archaeology and Museums, Haryana
Art Design Building, Sector-10, Chandigarh.

To

Dr. Nafees Ahamed

Memo No. 18/142 -2021-Pura/ 1629

Dated : 10/6/21

**Subject: Regarding information of Archaeological Sites/Monuments
along Sonipat-Palwal HIRC alignment**

Kindly reference to your e-mail dated 15.04.2021 on the subject cited above.

The information requested on the monuments/sites falling in and along the Sonipat-Palwal HIRC alignment is attached herewith for your kind information. Lists of both Centrally as well as State protected Monument/Site in the said alignment along with notifications of Prohibited and Regulated area of both Centre (The Archaeological Survey of India) and State (Archaeology and Museums Haryana) is provided for necessary action.

B. Bhattacharyya

Deputy Director
for Director Archaeology & Museums,
Haryana, Chandigarh.

Encl:

1. List of Centrally Protected monuments/sites (ASI)
2. List of State Protected monuments/sites
3. Notification of ASI for Prohibited and Regulated Area
4. Notification of Archaeology and Museums,
Haryana for Prohibited and Regulated Area.

List of Centrally protected monuments under Archaeological Survey of India

S.No	Name of the Monument	Locality	District	Longitude and Latitude
1.	Kos Minar No. 18	Alapur	Palwal	28°16.642' N 077°18.807' E
2.	Kos Minar No. 22	Aurangabad	Palwal	28°01.986' N 077°20.321' E
3.	Kos Minar No. 24	Banchchari	Palwal	27°57.696' N 077°20.405' E
4.	Kos Minar No. 25	Banchchari	Palwal	27°55.580' N 077°21.110' E
5.	Kos Minar No 27	Bhulwana	Palwal	27°52.098' N 077°23.758' E
6.	Kos Minar No 16	Gudhpuri	Palwal	28°15.023' N 077°17.246' E
7.	Kos Minar No. 17	Gudhpuri	Palwal	28°12.794' N 077°18.058' E
8.	Kos Minar No. 26	Hodal	Palwal	27°53.691' N 077°22.065' E
9.	Kos Minar No. 23.	Khatela	Palwal	27°59.812' N 077°19.772' E
10.	Kos Minar No. 21	Khera Sarai	Palwal	28°04.125' N 077°20.680' E
11.	Kos Minar No. 20	Khusropur	Palwal	28°06.316' N 077°20.020' E
12.	Kos Minar No.19	Palwal	Palwal	28°08.537' N 077°19.644' E
13.	Kos Minar No. 15	Sikri	Palwal	28°17.258' N 077°17.516' E
14.	Kos Minar No. 10	Khawaza Sarai	Faridabad	28°28.145' N 077°18.611' E
15.	Mughal Bridge over the Buddhia wala Nala	Khawaza Sarai	Faridabad	28°27.622' N 077°18.824' E
16.	Surajkund masonry tank	Lakkarpur	Faridabad	28°29.023' N 077°16.973' E
17.	Kos Minar No. 11	Village Mawai (Sec. 29, Faridabad)	Faridabad	28°26.015' N 077°19.179' E
18.	Kos Minar No. 13 (Missing)	Mujessar	Faridabad	
19.	Bund or Dam, 30 feet by 200	Anangpur	Faridabad	28°28.386' N 077°16.571' E
20.	Baoli Ghaus Ali Shah	Farrukh Nagar	Gurgaon	28°27.011' N 076°49.560' E
21.	Mosque of Ala Vardi Khan	Sarai Ali Vardi Khan	Gurgaon	28°29.965' N 077°01.084' E

22.	Old Mughal Kos Minar adjoining the north-western railway in Sonapat Tehsil	Akbarpur-Barota	Sonapat	28°53.733' N 077°04.174' E
23.	Old Mughal Kos Minars adjoining the North-Western railway in Sonapat Tehsil	Baiyanpur	Sonapat	28°57.736' N 077°01.978' E
24.	Old Mughal Kos Minars adjoining the North-Western railway in Sonapat Tehsil	Gannaur	Sonapat	29°06.735' N 077°01.053' E
25.	Old Mughal Kos Minars adjoining the North-Western railway in Sonapat Tehsil	Jagdishpur villages	Sonapat	22°02.180' N 077°03.153' E
26.	Old Mughal Kos Minars adjoining the North-Western railway in Sonapat Tehsil	Panchi Gujran	Sonapat	29°08.942' N 077°00.973' E
27.	Old Mughal Kos Minars adjoining the North-Western railway in Sonapat Tehsil	Rajpur	Sonapat	29°04.440' N 077°00.739' E
28.	Old Mughal Kos Minars adjoining the North-Western railway in Sonapat Tehsil	Sonapat	Sonapat	28°59.940' N 077°01.337' E
29.	Tomb of Khawaja Khizr	Sonapat	Sonapat	29°00.407' N 077°00.845' E
30.	Old Mughal Kos Minar adjoining the north-western railway in Sonapat Tehsil	Jawahri	Sonapat	29°02.180' N 077°00.856' E

List of State protected monuments under Department of Archaeology & Museums, Haryana

S.No	Name of the Monument	Locality	District	Longitude and Latitude
1.	Shishmahal	Farrukhnagar	Gurugram	Lat-28°26' 50"N Long-76°49' 22" E
2.	Lal Gumbad	Sap ki Nangli, Sohna	Gurugram	Lat-28°15' 00"N Long-77°2' 57" E
3.	Qutub Khan ki Masjid	Chungi Block, Sohna	Curugram	Lat-28°15' 21"N Long-77°3'60" E
4.	Ancient Gumbad (Maqbara),	Palwal	Palwal	Lat-28°9' 8 "N Long-77°19'21 " E
5.	Ancient mound Kachhi Kheda,	Garhi patti ,Hodal	Palwal	Lat-27°51' 42"N Long-77°20'5 " E
6.	Sati ka Talab & Chhatri	Hodal	Palwal	Lat-27°53' 32"N Long-77°22' 25" E

4.0 km/L
4.49/R
6.0/R

THE GAZETTE OF INDIA

DEPARTMENT OF CULTURE
(ARCHAEOLOGICAL SURVEY OF INDIA)
NEW DELHI, THE 16TH JUNE 1992
(ARCHAEOLOGY)

S.O.1764.—Whereas by the notification of the Government of India in the Department of Culture, Archaeological Survey of India no. S.O. 1447 dated the 15th May 1991, published in the Gazette of India, part II, Section 3, sub-section (ii) dated the 25th May 1991, the Central Government gave one month's notice of its intention to declare areas upto 100 meters from the protected limits and further beyond it upto 200 meters near or adjoining protected monuments to be prohibited and regulated areas respectively for purposes of both mining operation and construction;

And whereas the said Gazette was made available to the public on the 5th June 1991:

And whereas objections to the making of such declaration received from the person interested in the said areas have been considered by the Central Government.

Now, therefore, in exercise of the powers conferred by rule 32 of the Ancient Monuments and Archaeological Sites and Remains Rules, 1959, the Central Government hereby declares the said areas to be prohibited and regulated areas. This shall be in addition to and not in any way prejudice to similar declarations already made in respect of monuments at Fatehpur Sikri; Mamallapuram; Golconda Fort, Hyderabad, Andhra Pradesh; Thousand Pillared Temple, Hanamkonda, district Warangal, Andhra Pradesh; Sher Shah's Tomb, Sasaram, Bihar; Rock Edict of Ashoka, Kopbal, district Raichur, Karnataka; Fort Wall, Bijapur, Karnataka; Gomateswara Statue at Sravanabelagola, district Hassan, Karnataka; Elephanata Caves, Gharapuri, district Kolaba, Maharashtra.

[No. F. 8/2/90-M]
M.C. JOSHI,
Director General.



Haryana Government Gazette

Published by Authority

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No. 2-2018] CHANDIGARH, TUESDAY, JANUARY 9, 2018 (PAUSA 19, 1939 SAKA)

PART-I

Notifications, Orders and Declarations by Haryana Government

हरियाणा सरकार

पुरातत्व तथा संग्रहालय विभाग

अधिसूचना

दिनांक 20 दिसम्बर, 2017

क्र.सं.11/52-2000-पुरा/12677-12728.- चूंकि हरियाणा के राज्यपाल की राय है कि संरक्षित संस्मारकों के समीप और पार्श्वस्थ क्षेत्र में संरक्षित सीमा से 15 मीटर तक और उनसे परे 30 मीटर तक के क्षेत्र को खनन संक्रियाओं या सन्निर्माण या दोनों के प्रयोजनों के लिए कमशः प्रतिषिद्ध और विनियमित क्षेत्र के रूप में घोषित किया जाना है;

इसलिए, अब, पंजाब प्राचीन तथा ऐतिहासिक संस्मारक तथा पुरातत्वीय स्थल तथा अवशेष नियम, 1985, के नियम 30 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए तथा हरियाणा सरकार, पुरातत्व तथा संग्रहालय विभाग, अधिसूचना संख्या 11/52-2000-पुरा/ 6169-97, दिनांक 17 अक्तूबर, 2016 के प्रतिनिर्देश से, हरियाणा के राज्यपाल, इसके द्वारा, इस अधिसूचना से संलग्न सूची में यथावर्णित क्षेत्रों को खनन संक्रियाओं एवं सन्निर्माण दोनों के प्रयोजनों के लिए प्रतिषिद्ध और विनियमित क्षेत्रों के रूप में घोषित करते हैं।

धीरा खंडेलवाल,
अवर मुख्य सचिव, हरियाणा सरकार,

LISTS OF SENSITIVE RECEPTORS NEARBY THE PROPOSED HORC ALIGNMENT

S. NO.	(A) Nearest Habitat Location	Arial Distance (KM)	Side of Alignment
1	Asoti	> 0.19	Right
2	Jataula	> 0.13	Left
3	Prithala	0.42	Left
4	Chhaprola	0.11	Right
5	Khoontpuri	0.1	Left
6	Silani	0.22	Left
7	Karnki	0.34	Right
8	Sancholi	0.32	Right
9	Padheni	0.02	Left
10	Sheikhpur	0.12	Left
11	Kalwari	0.3	Left
12	Fazalwas	0.06	Left
13	Eakharpur	0.23	Left
14	Mokalwas	0.14	Left
15	IMT Maneswar	0.13	Right
16	Patli Hajipur	0.66	Left
17	Sultanpur	0.9	Right
18	Badli	0.81	Left
19	Bupania	0.85	Right
20	Daboda Khurd	0.26	Right
21	Mandothi	0.72	Left
22	Asauda	0.83	Right
23	Jasaur Kheri	0.69	Left
24	Pehladpur Kirholi	0.59	Right
25	Malha Majra	0.21	Right
26	Chhatera Bahadurpur	0.54	Left
27	Mandaur	0.37	Right
28	Jagdishpur	0.05	Right

S. No.	(B) Hospitals	Arial Distance (KM)	Side of Alignment
1	Sri Sathya Sai Sanjeevani International Centre for Child Heart Care & Research (Baghola)	5.57	Left
2	Govt Hospital- Palwal	12.09	Left
3	C.H.C DUDHOLA govt. hospital	3.08	Left
4	Malik Multispecility (Delhi Alwar Road)	11.73	
5	Civil Hospital- Baluda Rd Rajoria Nagar-Sohna	6.27	Right
6	Anand Hospital (Tauru)	3.33	Left
7	Civil Hospital- Tauru	4.11	Left
8	ESIC Hospital (IMT Manesar Sector 3)	3.63	Right
9	Park Hospital (Q Block South City 2, Sohna Rd)	17.87	Right
10	Artemis Hospital Gurgaon (Sector 51)	20.43	Right
11	Government Hospital- Sohna, Gurugram	3.58	Right
12	Max Hospital (Near Huda City Centre)	21.11	Right
13	Aarvy Hospital (Civil Lines Opp Nehru Stadium)	16.61	Right
14	Civil Hospital_Sector-10 Gurugram	13.5	Right
15	RS GAUR GLOBAL MULTISPECIALITY HOSPITAL, Jhajjar	16.7	Left
16	Oscar Super Specialty Hospital and Trauma Center-Jhajjar	16.64	Left
17	CIVIL HOSPITAL JHAJJAR	17	Left
18	Ujala Cygnus J. K. Hindu Hospital (Old Rohtak Rd near Hindu College of Engineering Industrial Area)	4.45	Left
19	Janta Charitable. H	5.3	Left
20	Memorial Hospital (Mama Bhanja Chowk Anand Nagar)	5.64	Left
21	Haryana Multispeciality Hospital	5.17	Left
22	Tulip Hospital	5.16	Left
23	Civil Hospital (Delhi Road, Near Maharana Pratap Chowk)	4.98	Left

S. No.	(C) NEAREST SCHOOLS	Arial Distance (KM)	Side of Alignment
1	Mewat Model School, NUH	3.55	Left
2	G C Senior Secondary School	3.11	Left

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Structure detail affected due to proposed HORC alignment

S. No.	Structure Name	Structure Type	Chainage	Part Affected	Land Use Type	Owner/Tennant	GPS Location		Type
1	Tubewell	Pucca	-960	100%	Agriculture field	Owner	28°14'47.00"N	77°15'39.60"E	Tubewell
2	Boundry wall	Semi Pucca	-700	50%	Agriculture field	Owner	28°14'41.10"N	77°15'31.71"E	Wall
3	well / kua	Pucca	-350	100%	Agriculture field	Owner	28°14'36.84"N	77°15'19.66"E	Borewell
4	House	Pucca	-120	100%	Agriculture field	Owner	28°14'32.40"N	77°15'12.48"E	Tubewell
5	Tubewell with one room	Semi Pucca	770	100%	Agriculture field	Owner	28°14'23.61"N	77°14'41.43"E	Tubewell
6	Tubewell with one room	Semi Pucca	1550	100%	Agriculture field	Owner	28°14'14.23"N	77°14'14.92"E	Residential
7	House	Pucca	1690	100%	Agriculture field	Owner	77°14'10.58"E	77°14'10.58"E	Residential
8	House	Pucca	1690	100%	Agriculture field	Owner	28°14'12.45"N	77°14'10.93"E	Residential
9	House	Pucca	1700	100%	Agriculture field	Owner	28°14'12.12"N	77°14'10.37"E	Residential
10	Shop	Pucca	1700	100%	Agriculture field	Owner	28°14'12.07"N	77°14'10.38"E	Commercial
11	House	Pucca	1700	100%	Agriculture field	Owner	28°14'12.33"N	77°14'9.57"E	Residential
12	House	Pucca	1700	100%	Agriculture field	Owner	28°14'11.98"N	77°14'9.81"E	Residential
13	House	Pucca	1700	100%	Agriculture field	Owner	28°14'11.76"N	77°14'9.83"E	Residential
14	House	Pucca	1710	100%	Agriculture field	Owner	28°14'11.67"N	77°14'9.35"E	Residential
15	House	Pucca	1710	100%	Agriculture field	Owner	28°14'12.02"N	77°14'8.78"E	Residential
16	House	Pucca	1710	100%	Agriculture field	Owner	28°14'11.81"N	77°14'8.97"E	Residential
17	House	Pucca	1710	100%	Agriculture field	Owner	28°14'11.64"N	77°14'8.88"E	Residential
18	House	Pucca	1710	100%	Agriculture field	Owner	28°14'11.47"N	77°14'8.95"E	Residential
19	House	Pucca	1710	100%	Agriculture field	Owner	28°14'12.25"N	77°14'9.15"E	Residential
20	House	Pucca	6510	30%	Agriculture field	Owner	28°13'49.88"N	77°11'16.18"E	Residential
21	Bore well and one Room	Semi Pucca	4550	50%	Agriculture field	Owner	28°13'54.36"N	77°12'28.60"E	Tubewell
22	Bore well and one Room	Semi Pucca	6510	100%	Agriculture field	Owner	28°13'49.88"N	77°11'16.18"E	Tubewell
23	Bore well	Pucca	7580	100%	Agriculture field	Owner	28°13'47.14"N	77°10'37.62"E	Borewell
24	IOCL Pipeline	Pipeline	9500	Intercept	IOCL	IOCL	28°13'41.68"N	77° 09'27.40"E	Pipeline
25	Agriculture well	Semi Pucca	11000	100%	Owner	Owner	28°13'35.56"N	77° 08'27.90"E	Wall
26	Room	Semi Pucca	11130	100%	Agriculture field	Owner	28°13'35.39"N	77° 08'27.80"E	Residential
27	Bhumiya	Semi Pucca	11200	100%	Agriculture field	Owner	28°13'35.42"N	77° 08'25.57"E	Smadhi
28	Field Boundary	Semi Pucca	115540	25%	Agriculture field	Owner	28°13'34.28"N	77° 08'18.44"E	Wall

S. No.	Structure Name	Structure Type	Chainage	Part Affected	Land Use Type	Owner/Tennant	GPS Location		Type
29	Field Boundary	Semi Pucca	11700	50%	Agriculture field	Owner	28°13'33.23"N	77° 08'08.13"E	Wall
30	Road Enchroachment (Shop)	Temporay Khoka	11700	100%	Road Side	Enchroachment	28°13'32.99"N	77° 08'08.26"E	Shop
31	Field Boundary	Pucca	11810	30%	Agriculture field	Owner	28°13'32.71"N	77° 08'08.30"E	Wall
32	Bore well and one Room	Semi Pucca	12300	30%	Agriculture field	Owner	28°13'29.81"N	77° 07'45.22"E	Residential
33	Room	Pucca	12400	100%	Agriculture field	Owner	28°13'28.78"N	77° 07'41.94"E	Residential
34	House	Semi Pucca	20980	100%	Habitation	Owner	28°10'50.27"N	77° 03'49.49"E	Residential
35	House	Semi Pucca	20980	100%	Habitation	Owner	28°10'50.27"N	77° 03'49.49"E	Residential
36	Water pump	Pucca	21000	100%	Habitation	Owner	28°10'50.72"N	77° 03'48.84"E	Water Body
37	Factory	Semi Pucca	24150	100%	Road Side	Owner	28°12'00.20"N	77° 02'51.47"E	Industry
38	Bore well	Pucca	28750	100%	Agriculture field	Owner	28°13'06.21"N	77° 00'39.21"E	Borewell
39	Bore well with one room	room Kuchha	28830	100%	Agriculture field	Owner	28°13'32.55"N	76°59'13.29"E	Residential
40	House	Pucca	30050	100%	Habitation	Owner	28°14'02.66"N	76°58'39.26"E	Residential
41	Boundry wall	Semi Pucca	30300	100%	Agriculture field	Owner	28°14'04.14"N	76°58'35.89"E	Wall
42	Bore well and Hut	Semi Pucca	30630	100%	Agriculture field	Owner	28°14'11.71"N	76°58'29.80"E	Borewell
43	Boundry wall	Semi Pucca	30680	100%	Habitation	Owner	28°14'10.60"N	76°58'29.09"E	Wall
44	Room	Semi Pucca	30650	100%	Agriculture field	Owner	28°13'24.05"N	76°59'32.83"E	Residential
45	House	Pucca	31150	100%	Habitation	Owner	28°13'29.61"N	76°59'18.11"E	Residential
46	House	Pucca	31150	100%	Habitation	Owner	28°13'29.46"N	76°59'17.80"E	Residential
47	House	Pucca	31150	50%	Habitation	Owner	28°13'29.83"N	76°59'16.34"E	Residential
48	House	Pucca	31150	50%	Habitation	Owner	28°13'30.89"N	76°59'15.90"E	Residential
49	House and domestic bore well	Pucca	31150	50%	Habitation	Owner	28°13'31.37"N	76°59'16.10"E	Residential
50	Bore well	Pucca	31780	100%	Agriculture field	Owner	28°13'42.69"N	76°58'58.79"E	Borewell
51	Bore well	Pucca	33400	100%	Agriculture field	Owner	28°14'20.72"N	76°58'17.58"E	Borewell
52	House	Semi Pucca	33500	25%	Habitation	Owner	28°14'22.44"N	76°58'14.87"E	Residential
53	Poultry farm	Kuchha	33600	100%	Poultry Farm	Owner	28°14'25.23"N	76°58'12.10"E	Farm
54	House type in Ag. Field	Semi Pucca	33900	100%	Agriculture field	Tennant	28°14'32.49"N	76°58'03.77"E	Residential
55	Bore well and one Room	room Kuchha	34050	100%	Agriculture field	Owner	28°14'35.90"N	76°58'01.08"E	Residential
56	Poultry farm and Bore well	Semi Pucca	34100	100%	Agriculture field	Owner	28°14'37.50"N	76°57'59.15"E	Farm
57	Boundry wall	Pucca Stone	34600	100%	Agriculture field	Owner	28°14'49.95"N	76°57'43.52"E	Wall

S. No.	Structure Name	Structure Type	Chainage	Part Affected	Land Use Type	Owner/Tennant	GPS Location		Type
58	Boundry wall	Pucca Stone	34650	30%	Agriculture field	Owner	28°14'51.49"N	76°57'41.09"E	Wall
59	Room & Teen Shade	Semi Pucca	34850	70%		Owner	28°14'53.59"N	76°57'39.24"E	Room
60	House	Pucca	35200	100%	Habitation	Owner	28°14'59.34"N	76°57'26.80"E	Residential
61	House in Ag. Field	Semi Pucca	36050	100%	Agriculture field	Owner	28°15'13.67"N	76°57'01.72"E	Residential
62	Bore well one room	room Kuchha	36250	100%	Agriculture field	Owner	28°15'16.37"N	76°56'54.64"E	Residential
63	Bore well teen Shade	Semi Pucca	36470	100%	Agriculture field	Owner	28°15'20.58"N	76°56'47.97"E	Borewell
64	Teen shade for Poultry Farm	Semi Pucca	36470	100%	Agriculture field	Owner	28°15'20.60"N	76°56'47.94"E	Teen shed
65	Bore well	Pucca	36490	100%	Agriculture field	Owner	28°15'20.94"N	76°56'47.10"E	Borewell
66	Residence in Ag. Foeld	Semi Pucca	36480	100%	Agriculture field	Owner	28°15'20.38"N	76°56'47.49"E	Residential
67	Borewell with Temp. room	Semi Pucca	36700	100%	Agriculture field	Owner	28°15'24.50"N	76°56'40.43"E	Residential
68	Bore well and one room	Semi Pucca	36980	100%	Agriculture field	Owner	28°15'29.11"N	76°56'31.37"E	Residential
69	one Room	Semi Pucca	37100	100%	Agriculture field	Owner	28°15'30.88"N	76°56'27.96"E	Residential
70	Bore well	Pucca	37650	100%	Agriculture field	Owner	28°15'41.96"N	76°56'11.88"E	Borewell
71	Two room	Pucca	37650	100%	Agriculture field	Owner	28°15'41.03"N	76°56'11.21"E	Residential
72	Bore well one room	Pucca	38350	100%	Agriculture field	Owner	28°15'55.52"N	76°55'51.60"E	Residential
73	Bore well one room	Pucca	38950	100%	Agriculture field	Owner	28°16'02.82"N	76°55'40.27"E	Residential
74	Bore well one room	Pucca	39020	100%	Agriculture field	Owner	28°16'09.02"N	76°55'31.92"E	Residential
75	Bore well one room	Pucca	39280	100%	Agriculture field	Owner	28°16'14.23"N	76°55'24.69"E	Residential
76	House	Pucca	39370	100%	Habitation	Owner	28°16'15.47"N	76°55'22.30"E	Residential
77	Poultry Shade	Semi Pucca	39370	100%	Habitation	Owner	28°16'15.89"N	76°55'22.97"E	Farm
78	Bore well one room	Pucca	39490	100%	Agriculture field	Owner	28°16'18.62"N	76°55'18.83"E	Residential
79	Bore well one room	Semi Pucca	40330	100%	Agriculture field	Owner	28°16'37.08"N	76°54'56.00"E	Residential
80	Bore well one room	Pucca	40440	100%	Agriculture field	Owner	28°16'39.51"N	76°54'53.37"E	Residential
81	Room	Semi Pucca	41000	100%	Agriculture field	Owner	28°16'55.48"N	76°54'42.21"E	Residential
82	Bore well one room	Semi Pucca	41410	100%	Agriculture field	Owner	28°17'06.67"N	76°54'34.37"E	Residential
83	House in Ag. Field	Pucca	41650	100%	Agriculture field	Owner	28°17'12.07"N	76°54'30.96"E	Residential
84	Poly house three	Temporay/kuc hha	41600	100%	Agriculture field	Owner	28°17'13.66"N	76°54'30.73"E	Residential
85	Industry	Semi Pucca	42490	100%	Agriculture field	Owner	28°17'36.67"N	76°54'14.86"E	Industry
86	Bore well	Pucca	42520	100%	Agriculture field	Owner	28°17'38.00"N	76°54'14.92"E	Borewell
87	Teen shed	Semi Pucca	42600	100%	Agriculture field	Owner	28°17'39.83"N	76°54'12.78"E	Teen shed

S. No.	Structure Name	Structure Type	Chainage	Part Affected	Land Use Type	Owner/Tennant	GPS Location		Type
88	House in Ag. Field	Semi Pucca	42850	100%	Agriculture field	Owner	28°17'47.46"N	76°54'08.71"E	Residential
89	Bore well one room	Semi Pucca	42990	100%	Agriculture field	Owner	28°17'51.48"N	76°54'07.17"E	Residential
90	Gaushala	Teen Shade Semi Pucca	43350	25%	Agriculture field	Owner	28°18'02.17"N	76°54'01.02"E	Residential
91	Farm House Boundry	Semi Pucca	43350	50%	Agriculture field	Owner	28°18'06.88"N	76°53'57.34"E	Wall
92	Boundry wall	Semi Pucca	43730	50%	Agriculture field	Owner	28°18'12.93"N	76°53'53.79"E	Wall
93	House	Pucca	40760	100%	Habitation	Owner	28°18'10.92"N	76°53'55.70"E	Residential
94	Industry	Pucca	43850	30%	Industrial Area	Owner	28°18'15.44"N	76°53'52.65"E	Industry
95	House	Pucca	43950	100%	Habitation	Owner	28°18'19.12"N	76°53'51.09"E	Residential
96	Temp. Structure	Kuchha	44550	100%	Barren Area	Owner	28°18'38.67"N	76°53'47.22"E	Residential
97	Cremation Yard	Pucca	44600	100%	Samsan Ghat	Owner	28°18'40.22"N	76°53'47.52"E	Cremation Ground
98	Boundry wall	pucca	45200	40%	Industry	Owner	28°18'57.28"N	76°53'43.45"E	Wall
99	Teen shade	Semi Pucca	45190	40%	Industry	Owner	28°18'58.03"N	76°53'43.78"E	Teen shed
100	Boundry wall	Semi Pucca	45500	100%	Habitation	Owner	28°19'10.59"N	76°53'41.96"E	Wall
101	Bore well and one room	Semi Pucca	46200	100%	Agriculture field	Owner	28°19'28.27"N	76°53'33.09"E	Residential
102	Bore well and one room	Pucca	46450	100%	Agriculture field	Owner	28°19'42.16"N	76°53'22.44"E	Residential
103	Closed Gaushala	Semi Pucca	46680	100%	Agriculture field	Owner	28°19'40.90"N	76°53'21.26"E	Residential
104	Bore well and one room	Semi Pucca	47110	100%	Agriculture field	Owner	28°19'54.15"N	76°53'12.90"E	Residential
105	Borewell	Pucca	47200	100%	Agriculture field	Owner	28°19'56.33"N	76°53'11.05"E	Borewell
106	Smadhi	Pucca	47210	100%	Agriculture field	Owner	28°19'57.13"N	76°53'09.95"E	Smadhi
107	One Room	Pucca	47200	100%	Agriculture field	Owner	28°19'57.13"N	76°53'09.95"E	Residential
108	House	Pucca	48100	50%	Habitation	Owner	28°20'24.11"N	76°53'00.55"E	Residential
109	Teen Shade	Semi Pucca	48420	100%	Habitation	Owner	28°20'34.02"N	76°52'58.86"E	Teen shed
110	Bore well and one room	Semi Pucca	48950	100%	Agriculture field	Owner	28°20'51.07"N	76°52'56.22"E	Residential
111	House	Pucca	52300	100%	Agriculture field	Owner	28°22'36.56"N	76°52'22.64"E	Residential
112	Boundry wall	Semi Pucca	53850	30%	Agriculture field	Owner	28°23'14.22"N	76°52'11.48"E	Wall
113	House and Domestic bore well	Pucca	54980	50%	Habitation	Owner	28°24'34.01"N	76°52'08.93"E	Residential
114	House	Semi Pucca	56010	100%	Habitation	Owner	28°24'34.79"N	76°52'09.73"E	Residential
115	Bore well and one room	Semi Pucca	56240	100%	Agriculture field	Owner	28°24'41.66"N	76°52'06.24"E	Residential
116	Bore well and one room	Semi Pucca	56530	100%	Agriculture field	Owner	28°24'51.47"N	76°52'05.72"E	Residential
117	one room	Semi Pucca	57480	100%	Agriculture field	Owner	28°25'21.22"N	76°51'57.64"E	Residential

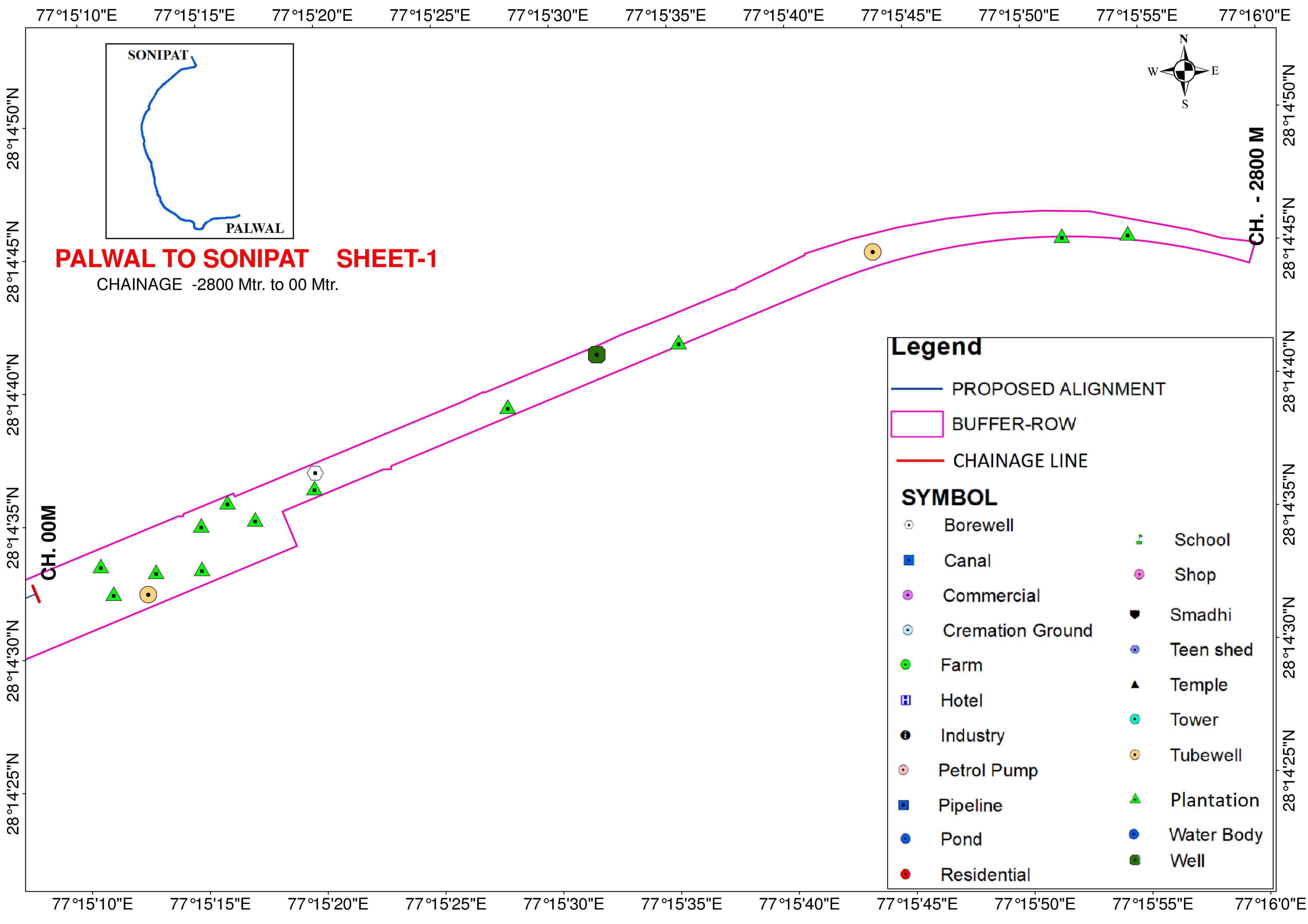
S. No.	Structure Name	Structure Type	Chainage	Part Affected	Land Use Type	Owner/Tennant	GPS Location		Type
118	Bore well and one room	Semi Pucca	57850	100%	Agriculture field	Owner	28°25'32.88"N	76°51'55.46"E	Residential
119	Ice Factory	Pucca	59190	100%	Habitation	Owner	28°26'15.56"N	76°51'44.89"E	Industry
120	Teen Shade Dairy	Semi Pucca	59350	100%	Agriculture field	Owner	28°26'20.85"N	76°51'43.21"E	Teen shed
121	Pond(Fisheries)	Artificial Structure	69200	50%	LAND PLOT	Owner	28°31'23.88"N	76°49'57.40"E	Pond
122	Canal	Government	69900	100%	Government	Government	28°31'42.54"N	76°49'49.63"E	Canal
123	Pond	Artificial Structure	70350	40%	LAND PLOT	Owner	28°31'59.30"N	76°49'44.38"E	Pond
124	Service Canter	Semi-Pucca	73450	100%	LAND PLOT	Owner	28°33'37.15"N	76°49'23.78"E	Commercial
125	Pond	Semi-Pucca	76300	100%	Private Plot	Owner	28°35'07.90"N	76°49'14.64"E	Pond
126	pond	Semi-Pucca		100%	Private Plot	Owner	28°30'33.61"N	76°49'25.18"E	Pond
127	Nahar	Pucca	83100	100%	Owner	Owner	28°38'45.59"N	76°48'48.29"E	Canal
128	Pond	Artificial Structure	73460	100%	LAND PLOT	Owner	28°33'37.64"N	76°49'22.96"E	Pond
129	Kothri	Semi-Pucca	73400	100%	Private	Owner	28°33'35.64"N	76°49'23.92"E	Residential
130	ROOMS(Commercial)	Pucca	75380	100%	Private	Owner	28°34'39.18"N	76°49'23.98"E	Residential
131	Pond	Artificial Structure	76290	50%	LAND PLOT	Owner	28°35'07.73"N	76°49'15.21"E	Pond
132	Pond	Artificial Structure	76600	50%	LAND PLOT	Owner	28°35'19.40"N	76°49'10.89"E	Pond
133	Govt. P.Pamp	Pucca	80400	100%	Private	Owner	28°37'18.36"N	76°48'49.07"E	Patrol Pamp
134	Canal	Government	83+100	NA	Government	Government	28°38'45.56"N	76°48'49.35"E	Canal
135	Temple	Pucca	84+500	100%	Private Plot	Owner	28°39'30.60"N	76°48'59.02"E	Temple
136	Dhram Kanta(Weighing Station)	Pucca	84+550	100%	Private Plot	Owner	28°39'32.29"N	76°48'59.53"E	Weighing Station
137	Home	Semi-Pucca	84+570	100%	Habitation	Owner	28°39'36.48"N	76°49'01.62"E	Residential
138	Pond/Boundry Wall	Pucca	85100 to 85300	100%	Agriculture field	Owner	28°39'51.07"N	76°49'06.56"E	Pond
139	Pond	Artificial Structure	85+550	100%	LAND PLOT	Owner	28°39'37.33"N	76°49'01.92"E	Pond
140	Shed	Semi-Pucca	86+000	100%	Agriculture field	Owner	28°40'43.19"N	76°49'19.68"E	Teen shed
141	Tubewell	Pucca	87+700	100%	Agriculture field	Owner	28°41'16.15"N	76°49'34.50"E	Tubewell
142	Borewell	Pucca	89+300 to 89+400	100%	Agriculture field	Owner	28°42'01.35"N	76°49'55.30"E	Borewell
143	Pond	Artificial Structure	89+700	50%	LAND PLOT	Owner	28°42'10.51"N	76°50'00.39"E	Pond

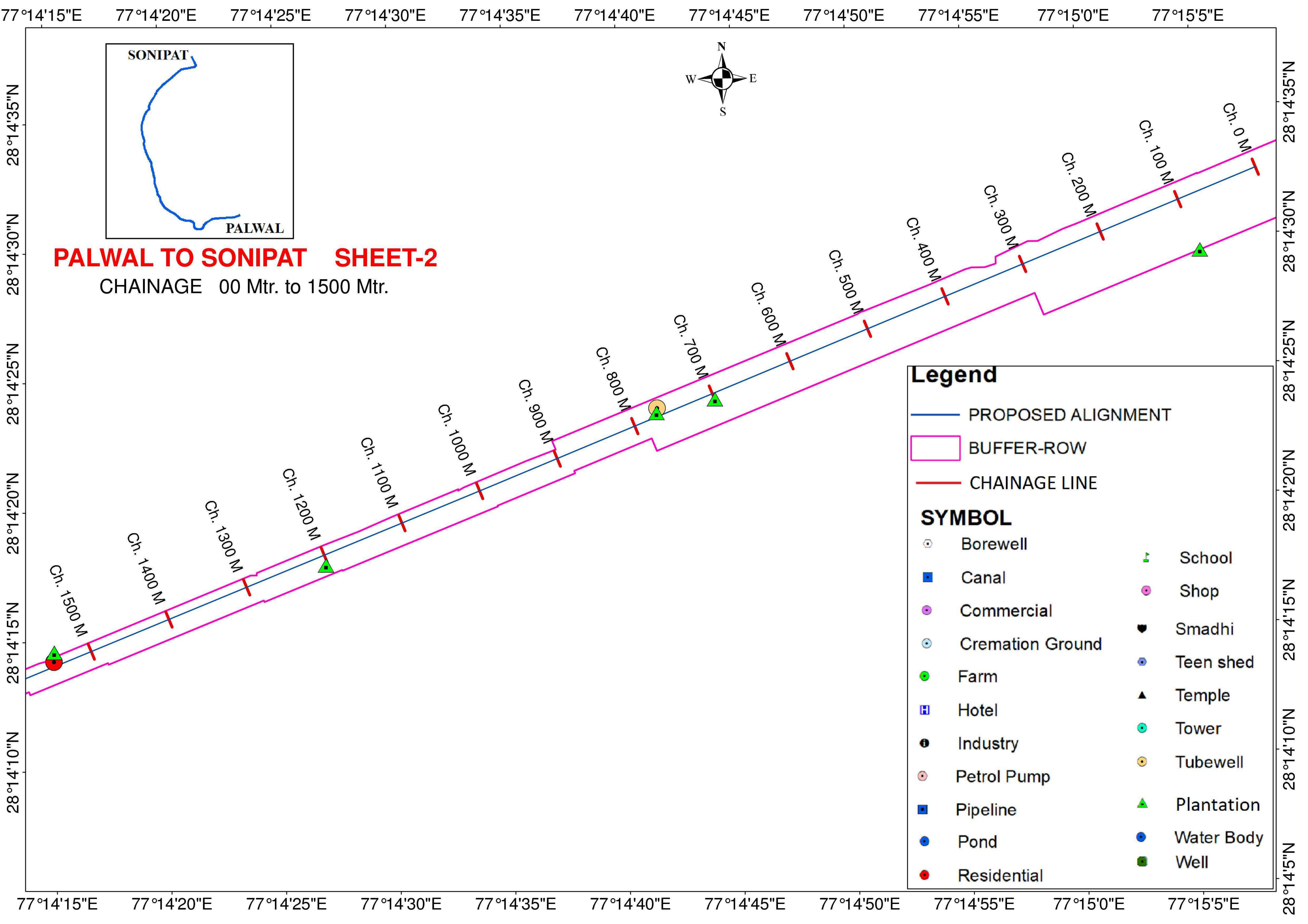
S. No.	Structure Name	Structure Type	Chainage	Part Affected	Land Use Type	Owner/Tenant	GPS Location		Type
144	Dhabba	Semi-Pucca	93+250	50%	Agriculture field	TENANT	28°43'47.69"N	76°50'47.45"E	Hotel
145	Canal	Government	93+400	NA	Agriculture field	Government	28°43'50.14"N	76°50'47.11"E	Canal
146	Solid Waste Factory	Pucca	93+600	100%	Agriculture field	Leassed	28°43'59.04"N	76°50'51.03"E	Industry
147	Factory(Commercial)	Pucca	94+100	100%	Agriculture field	Leassed	28°44'13.11"N	76°50'56.82"E	Industry
148	Tubewell	Pucca	94+250	100%	Agriculture field	Owner	28°44'17.72"N	76°50'58.11"E	Tubewell
149	Canal	Government	94+270	NA	NA	Government	28°44'24.68"N	76°51'01.18"E	Canal
150	Room	Pucca	94+900	100%	Agriculture field	Owner	28°44'38.86"N	76°51'09.30"E	Residential
151	Canal	Government	95+050	NA	NA	Government	28°44'42.66"N	76°51'09.14"E	Canal
152	Tubewell	Pucca	95+900	100%	Agriculture field	Owner	28°45'11.23"N	76°51'23.71"E	Tubewell
153	Well	Pucca	96+250	100%	Agriculture field	Owner	28°45'16.53"N	76°51'26.92"E	Well
154	Room Closet (Agri-Field)	Pucca	96+300	100%	Agriculture field	Owner	28°45'18.05"N	76°51'28.68"E	Residential
155	House	Pucca	96+370	50%	Habitation	Owner	28°45'20.77"N	76°51'29.86"E	Residential
156	Borewell	Pucca	96+300	100%	Agriculture field	Owner	28°45'17.91"N	76°51'28.40"E	Borewell
157	Canal	Government	96+450	100%	NA	Government	28°45'30.92"N	76°51'37.91"E	Canal
158	Home	Pucca	97+100	20%	Agriculture field	Owner	28°45'30.92"N	76°51'37.91"E	Residential
159	Well	Pucca	97+300	100%	Agriculture field	Owner	28°45'46.79"N	76°51'48.12"E	Well
160	Borewell	Pucca	97+700	100%	Agriculture field	Owner	28°45'50.22"N	76°51'50.69"E	Borewell
161	Private School	Pucca	98+000	50%	Private Plot	Owner	28°46'06.28"N	76°52'02.47"E	School
162	Petrol Pump	Pucca	98+200	30%	Road Side Land	Leased	28°46'10.63"N	76°52'05.32"E	Petrol Pump
163	Tubewell	Pucca	98+350	100%	Agriculture field	Owner	28°46'16.63"N	76°52'08.13"E	Tubewell
164	Tubewell	Pucca	98+380	100%	Agriculture field	Owner	28°46'18.32"N	76°52'08.92"E	Tubewell
165	Room	Pucca	98+600	100%	Agriculture field	Owner	28°45'50.10"N	76°51'50.62"E	Residential
166	Shop(Tubewell)	Semi-Pucca	99+350	100%	Agriculture field	Owner	28°46'45.29"N	76°52'23.12"E	Shop
167	Kothri	Pucca	99+350	100%	Agriculture field	Owner	28°46'45.29"N	76°52'23.12"E	Residential
168	Borewell	Pucca	99+950	100%	Agriculture field	Owner	28°47'01.87"N	76°52'31.85"E	Borewell
169	Borewell	Pucca	100+150	100%	Agriculture field	Owner	28°47'10.85"N	76°52'36.45"E	Borewell
170	Borewell	Pucca	100+150	100%	Agriculture field	Owner	28°47'12.48"N	76°52'37.21"E	Borewell
171	Borewell	Pucca	100+250	100%	Agriculture field	Owner	28°47'15.34"N	76°52'38.75"E	Borewell
172	Borewell	Pucca	100+300	100%	Agriculture field	Owner	28°47'17.88"N	76°52'40.65"E	Borewell
173	Kothri	Pucca	100+900	100%	Agriculture field	Owner	28°47'29.71"N	76°52'46.45"E	Residential
174	Borewell	Pucca	100+900	100%	Agriculture field	Owner	28°47'32.46"N	76°52'49.05"E	Borewell

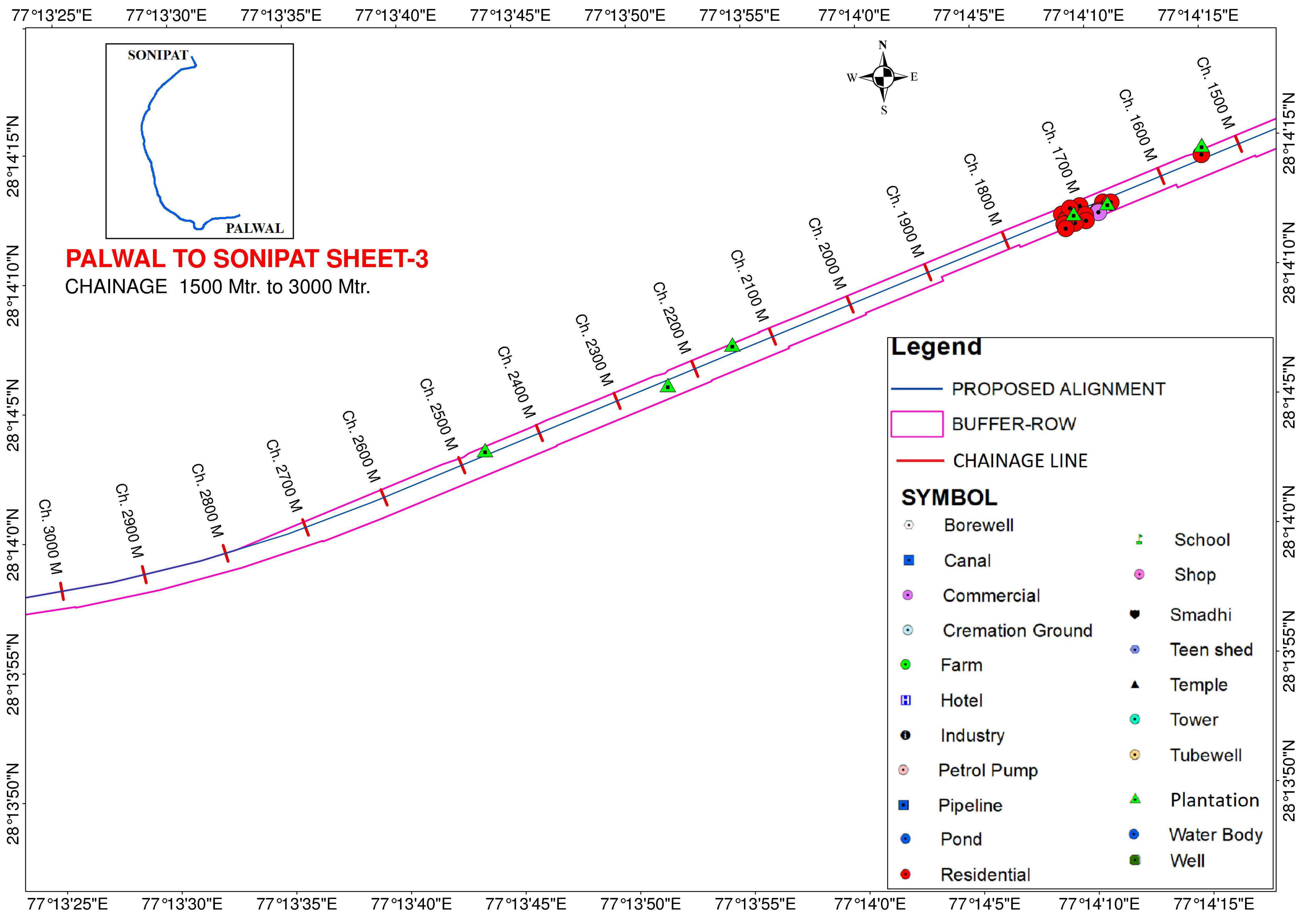
S. No.	Structure Name	Structure Type	Chainage	Part Affected	Land Use Type	Owner/Tennant	GPS Location		Type
175	Tower	Pucca	100+950	100%	Agriculture field	Owner	28°47'32.46"N	76°52'49.05"E	Tower
176	Tubewell	Pucca	101+800	100%	Agriculture field	Owner	28°47'57.89"N	76°53'03.67"E	Tubewell
177	Borewell	Pucca	101+950	100%	Agriculture field	Owner	28°48'03.11"N	76°53'06.16"E	Borewell
178	Kothri	Pucca	102+700	100%	Agriculture field	Owner	28°48'20.50"N	76°53'24.69"E	Residential
179	Well	Pucca	102+900	100%	Agriculture field	Owner	28°48'25.17"N	76°53'28.87"E	Well
180	Canal	Pucca	102+900	100%	Government	Owner	28°48'25.11"N	76°53'27.20"E	Canal
181	Tubewell	Pucca	103+200	100%	Agriculture field	Owner	28°48'32.10"N	76°53'35.40"E	Tubewell
182	Kothri	Semi-Pucca	104+900	100%	Agriculture field	Owner	28°49'14.63"N	76°54'17.34"E	Residential
183	House	Pucca	110+450	100%	Agriculture field	Owner	28°51'20.75"N	76°56'46.03"E	Residential
184	Tubewell	Pucca	110+450	100%	Agriculture field	Owner	28°51'21.61"N	76°56'45.75"E	Tubewell
185	Tubewell	Pucca	110+500	100%	Agriculture field	Owner	28°51'19.75"N	76°56'45.54"E	Tubewell
186	Tubewell	Pucca	110+530	100%	Agriculture field	Owner	28°51'20.18"N	76°56'45.51"E	Tubewell
187	Tubewell	Pucca	110+600	100%	Agriculture field	Owner	28°51'22.21"N	76°56'47.75"E	Tubewell
188	Tubewell	Pucca	111+900	100%	Agriculture field	Owner	28°51'53.05"N	76°57'23.03"E	Tubewell
189	Tubewell	Pucca	112+800	100%	Agriculture field	Owner	28°52'12.56"N	76°57'45.69"E	Tubewell
190	Tubewell	Pucca	113+000	100%	Agriculture field	Owner	28°52'18.08"N	76°57'50.93"E	Tubewell
191	Tubewell	Pucca	113+000	100%	Agriculture field	Owner	28°52'18.08"N	76°57'50.93"E	Tubewell
192	Tubewell	Pucca	113+000	100%	Agriculture field	Owner	28°52'16.38"N	76°57'50.60"E	Tubewell
193	Room Closet	Pucca	113+000	100%	Agriculture field	Owner	28°52'18.08"N	76°57'50.93"E	Residential
194	Kothri	Pucca	114+850	100%	Agriculture field	Owner	28°52'59.08"N	76°58'40.70"E	Residential
195	kothri	Semi-Pucca	115+350	100%	Agriculture field	Owner	28°53'10.32"N	76°58'53.87"E	Residential
196	Tubewell	Pucca	115+550	100%	Agriculture field	Owner	28°53'14.16"N	76°58'58.56"E	Tubewell
197	Borewell	Pucca	115+900	100%	Agriculture field	Owner	28°53'23.26"N	76°59'08.47"E	Borewell
198	Borewell	Pucca	116+000	100%	Agriculture field	Owner	28°53'24.77"N	76°59'10.31"E	Borewell
199	Borewell	Pucca	116+000	100%	Agriculture field	Owner	28°53'24.77"N	76°59'10.31"E	Borewell
200	Borewell	Pucca	116+050	100%	Agriculture field	Owner	28°53'25.27"N	76°59'11.02"E	Borewell
201	Kothri	Pucca	116+100	100%	Agriculture field	Owner	28°53'25.72"N	76°59'13.58"E	Residential
202	Borewell	Pucca	116+250	100%	Agriculture field	Owner	28°53'29.72"N	76°59'19.12"E	Borewell
203	Tubewell	Pucca	116+350	100%	Agriculture field	Owner	28°53'31.56"N	76°59'20.72"E	Tubewell
204	Borewell	Pucca	116+950	100%	Agriculture field	Owner	28°53'37.22"N	76°59'41.00"E	Borewell
205	Borewell	Pucca	117+080	100%	Agriculture field	Owner	28°53'39.19"N	76°59'45.98"E	Borewell

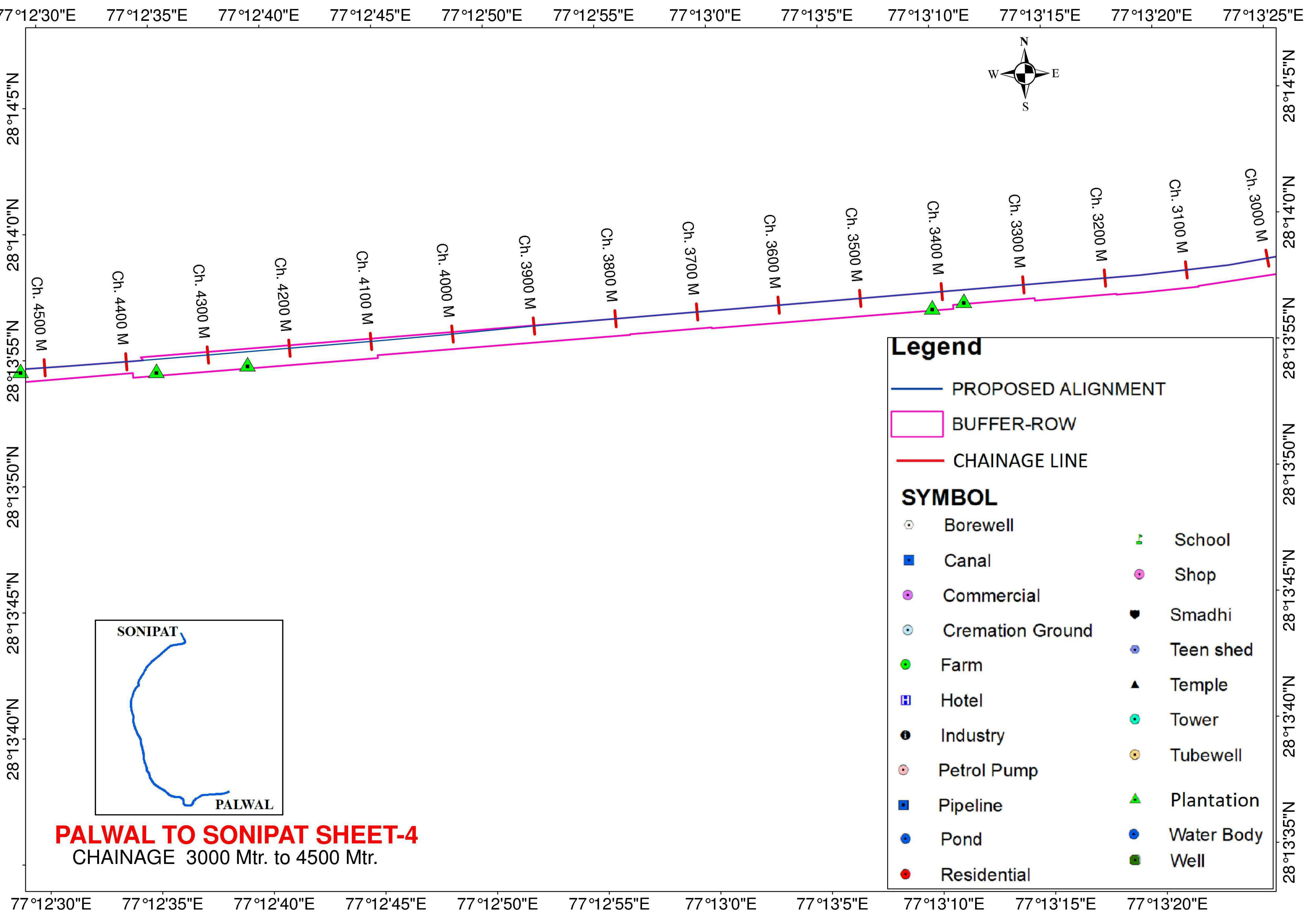
S. No.	Structure Name	Structure Type	Chainage	Part Affected	Land Use Type	Owner/Tenant	GPS Location		Type
206	Tubewell	Pucca	117+200	100%	Agriculture field	Owner	28°53'39.22"N	76°59'50.99"E	Tubewell
207	Kothri	Pucca	117+350	100%	Agriculture field	Owner	28°53'40.78"N	76°59'55.51"E	Residential
208	Tubewell	Pucca	117+350	100%	Agriculture field	Owner	28°53'40.78"N	76°59'55.51"E	Tubewell
209	Tubewell	Pucca	118+550	100%	Agriculture field	Owner	28°53'48.19"N	77° 00'40.88"E	Tubewell
210	Kothri	Pucca	118+700	100%	Agriculture field	Owner	28°53'50.00"N	77° 00'43.21"E	Residential
211	Tubewell	Pucca	118+700	100%	Agriculture field	Owner	28°53'50.42"N	77° 00'44.14"E	Tubewell
212	Hodi	Temprory	118+700	100%	Agriculture field	Owner	28°53'50.47"N	77° 00'44.03"E	Water Body
213	Pond	Artificial Structure	118+700 to 118+800	100%	Agriculture field	Owner	28°53'50.17"N	77° 00'44.70"E	Pond
214	Kothri	Pucca	118+850	100%	Agriculture field	Owner	28°53'50.99"N	77° 00'50.88"E	Residential
215	Kothri	Pucca	119+850	100%	Agriculture field	Owner	28°53'57.28"N	77° 01'25.21"E	Residential
216	Tubewell	Pucca	119+850	100%	Agriculture field	Owner	28°53'57.35"N	77° 01'25.14"E	Tubewell
217	Teen Shade	Semi-Pucca	120+550	100%	LAND PLOT	Owner	28°54'02.53"N	77° 01'49.92"E	Teen Shade
218	Kothri	Pucca	125+150	100%	LAND PLOT	Owner	28°55'36.49"N	77° 02'50.44"E	Residential
219	Temple	Pucca	126+000	100%	LAND PLOT	Owner	28°56'01.13"N	77° 02'38.51"E	Temple
220	Temple	Pucca	127+650	100%	LAND PLOT	Owner	28°56'51.31"N	77° 02'14.12"E	Temple
221	Kothri	Semi-Pucca	3+690	100%	LAND PLOT	Owner	28°43'46.25"N	76°52'11.29"E	Residential
222	Kothri	Pucca	3+690	100%	LAND PLOT	Owner	28°43'46.74"N	76°52'12.10"E	Residential
223	RCC Shed (Commercial)	Pucca	3+690	50%	LAND PLOT	Owner	28°43'46.29"N	76°52'12.48"E	Teen shed
224	Room (Commercial)	Pucca	3+550	100%	LAND PLOT	Owner	28°43'40.67"N	76°52'90.26"E	Residential

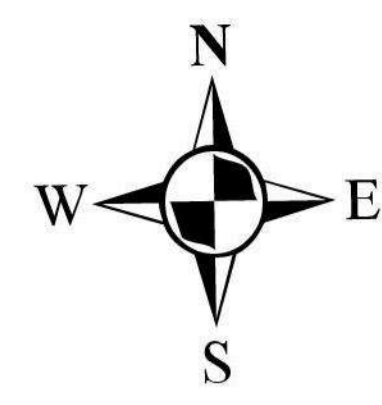
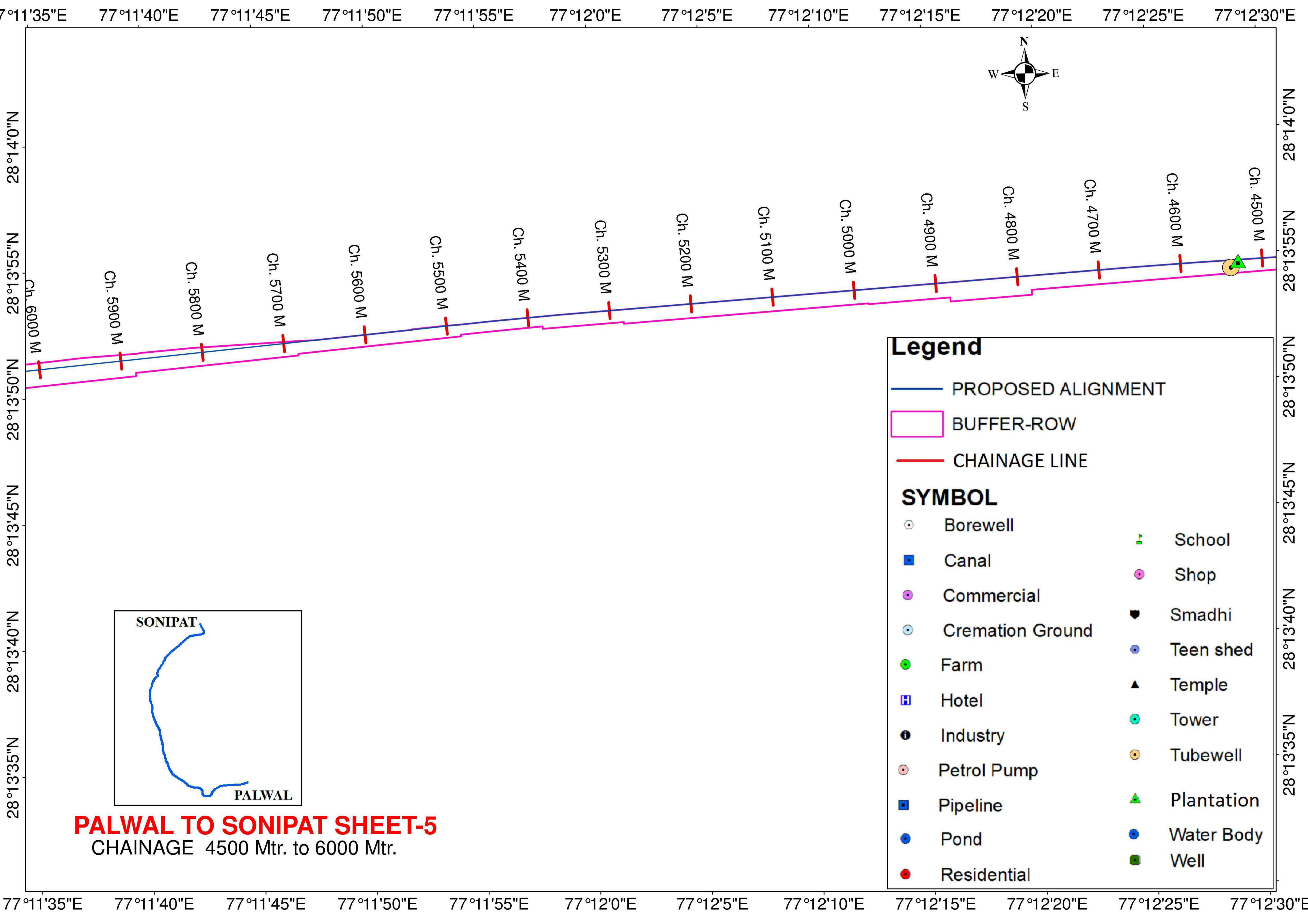
Annexure 4.3 Strip Map/Plan









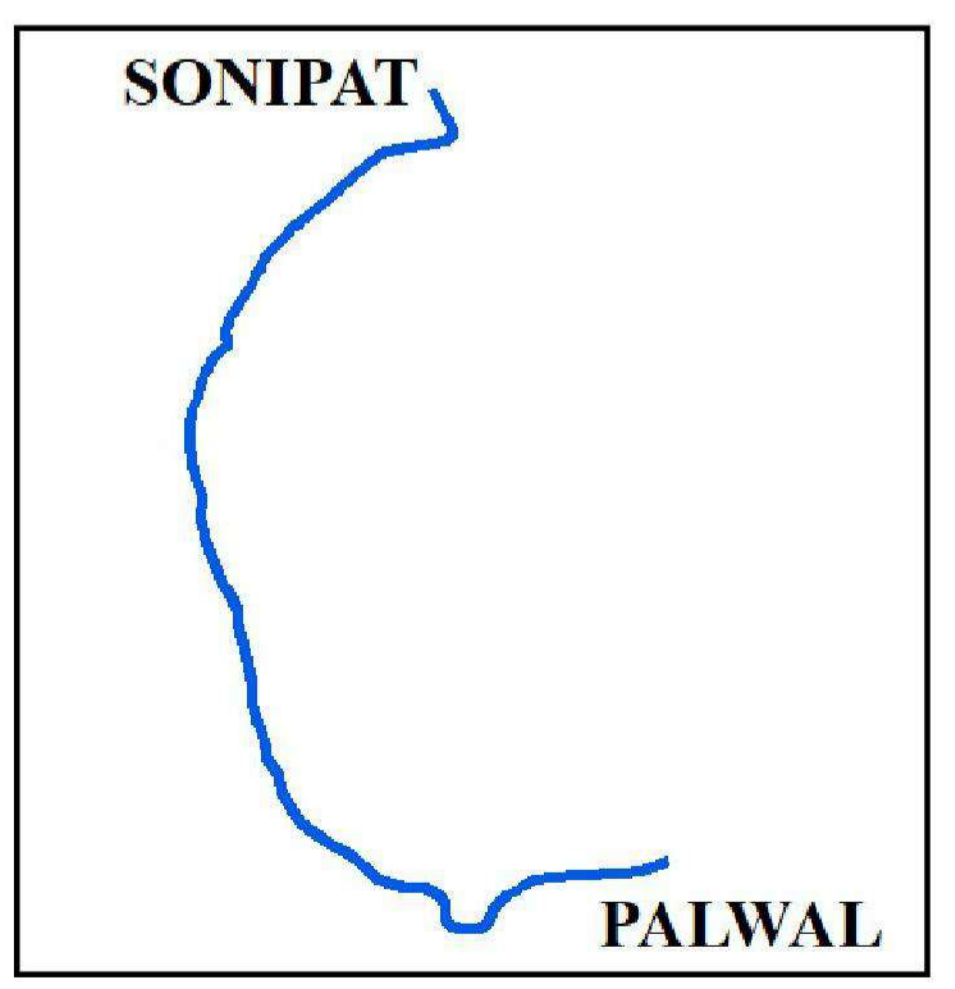


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

○ Borewell	▬ School
■ Canal	○ Shop
○ Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
ⓘ Industry	○ Tubewell
○ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

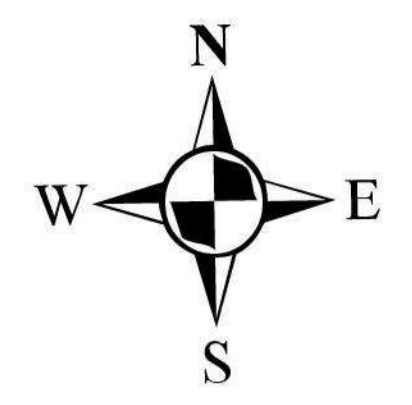
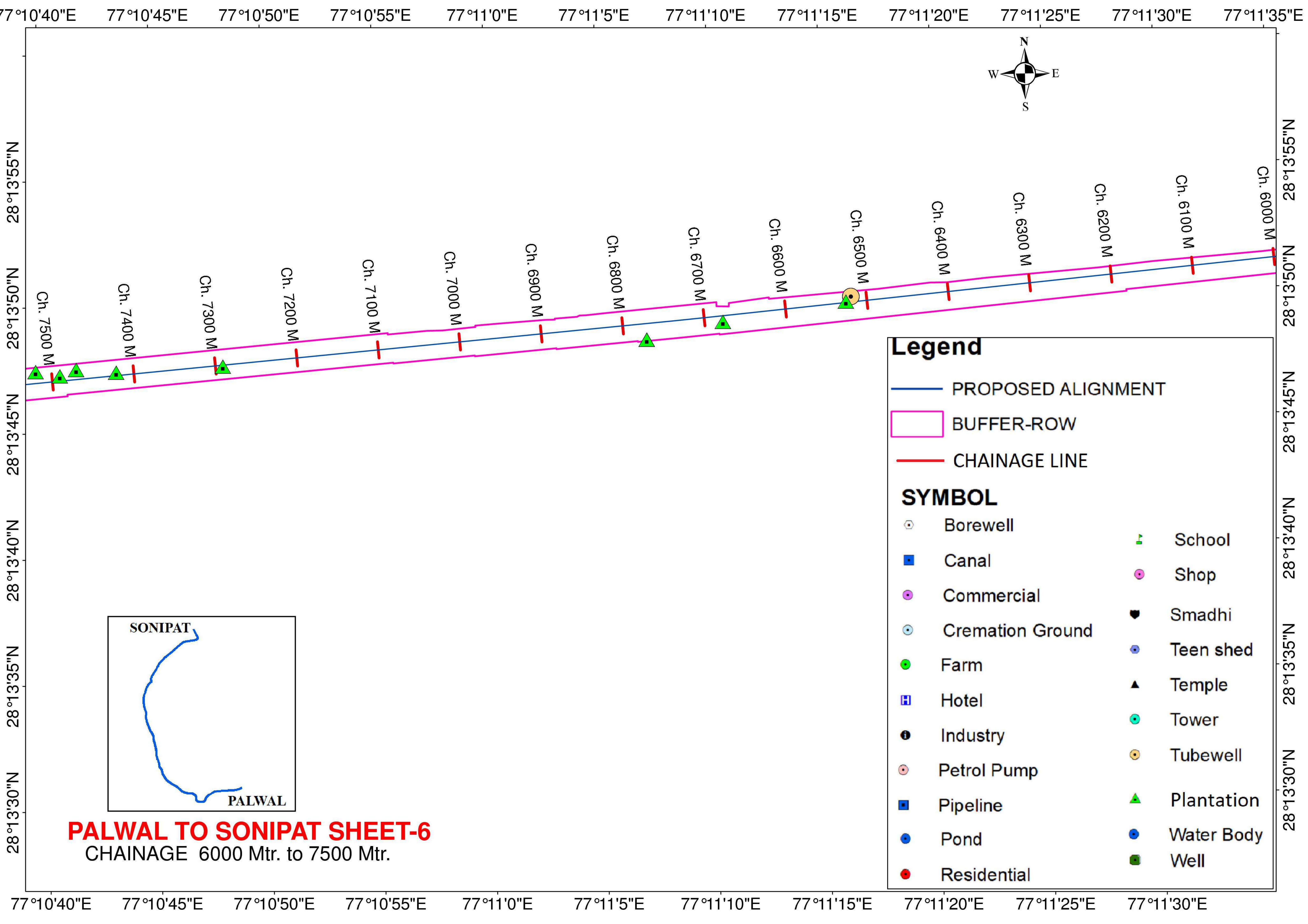


PALWAL TO SONIPAT SHEET-5
CHAINAGE 4500 Mtr. to 6000 Mtr.

77°11'35"E 77°11'40"E 77°11'45"E 77°11'50"E 77°11'55"E 77°12'0"E 77°12'5"E 77°12'10"E 77°12'15"E 77°12'20"E 77°12'25"E 77°12'30"E

28°13'35"N 28°13'40"N 28°13'45"N 28°13'50"N 28°13'55"N 28°14'0"N

Ch. 6000 M
Ch. 5900 M
Ch. 5800 M
Ch. 5700 M
Ch. 5600 M
Ch. 5500 M
Ch. 5400 M
Ch. 5300 M
Ch. 5200 M
Ch. 5100 M
Ch. 5000 M
Ch. 4900 M
Ch. 4800 M
Ch. 4700 M
Ch. 4600 M
Ch. 4500 M

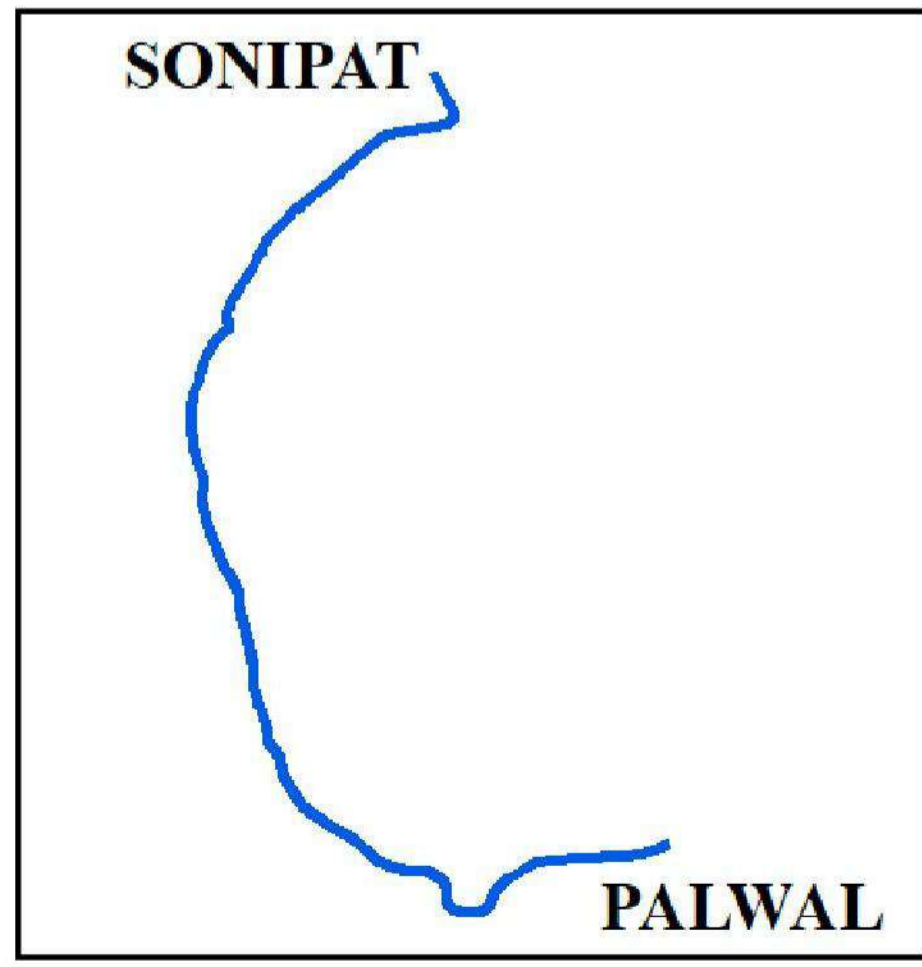


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

○ Borewell	⚡ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
🏠 Hotel	⊙ Tower
ⓘ Industry	● Tubewell
⊙ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

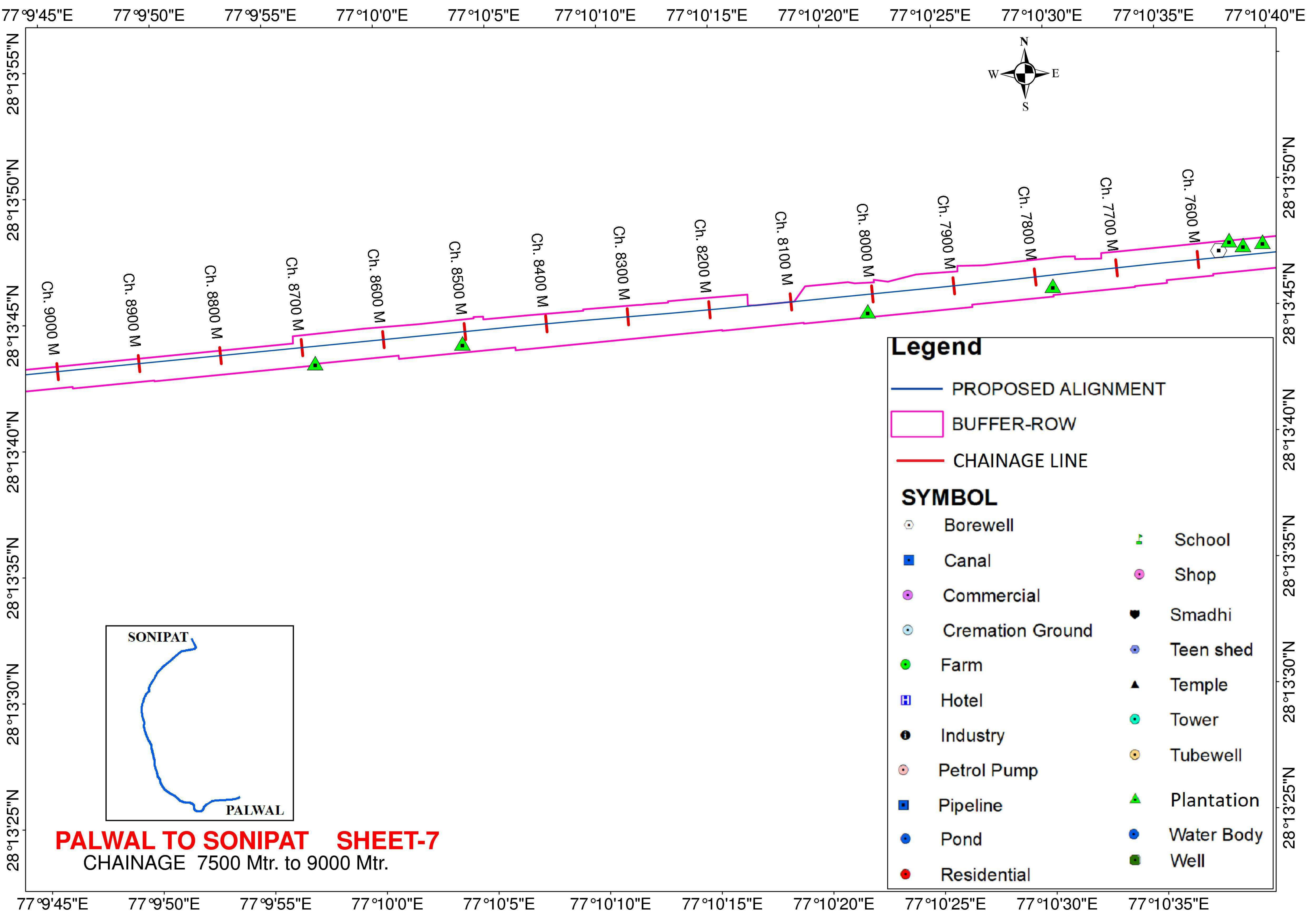


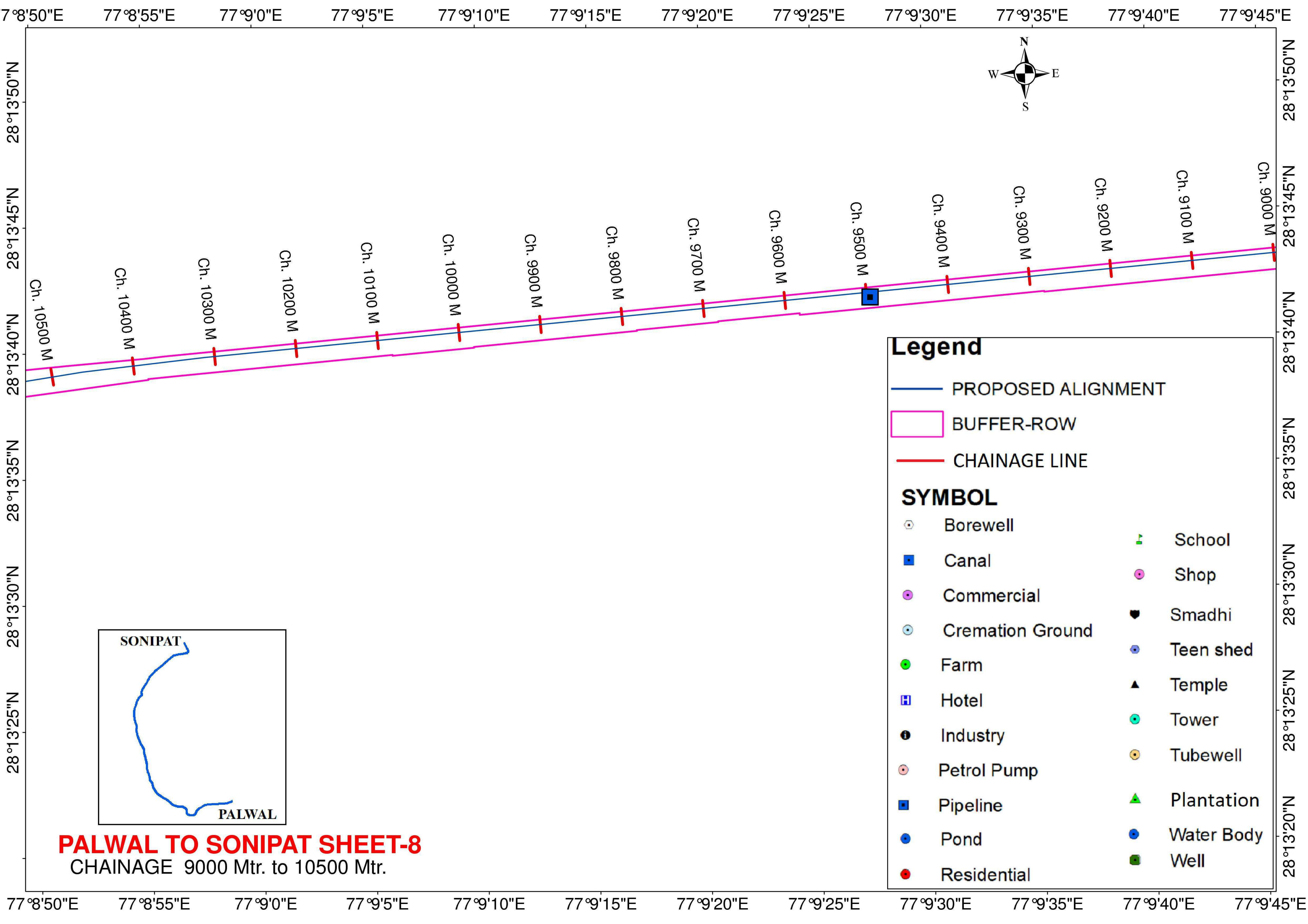
PALWAL TO SONIPAT SHEET-6
CHAINAGE 6000 Mtr. to 7500 Mtr.

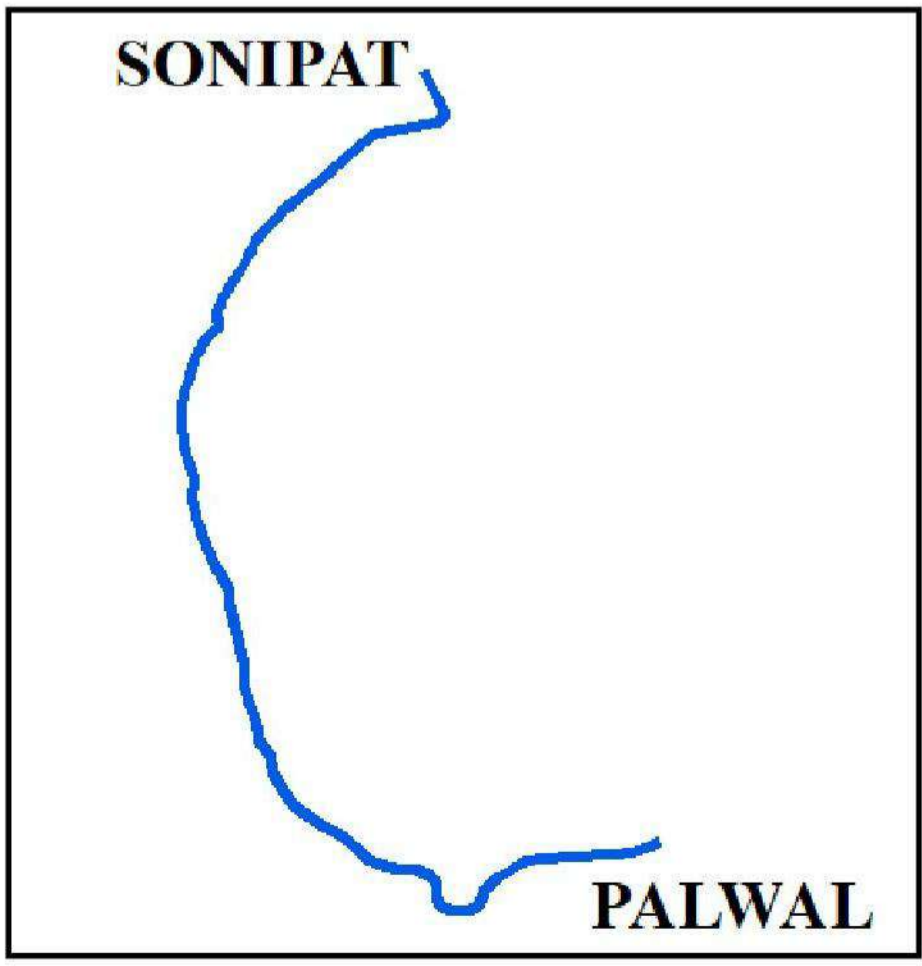
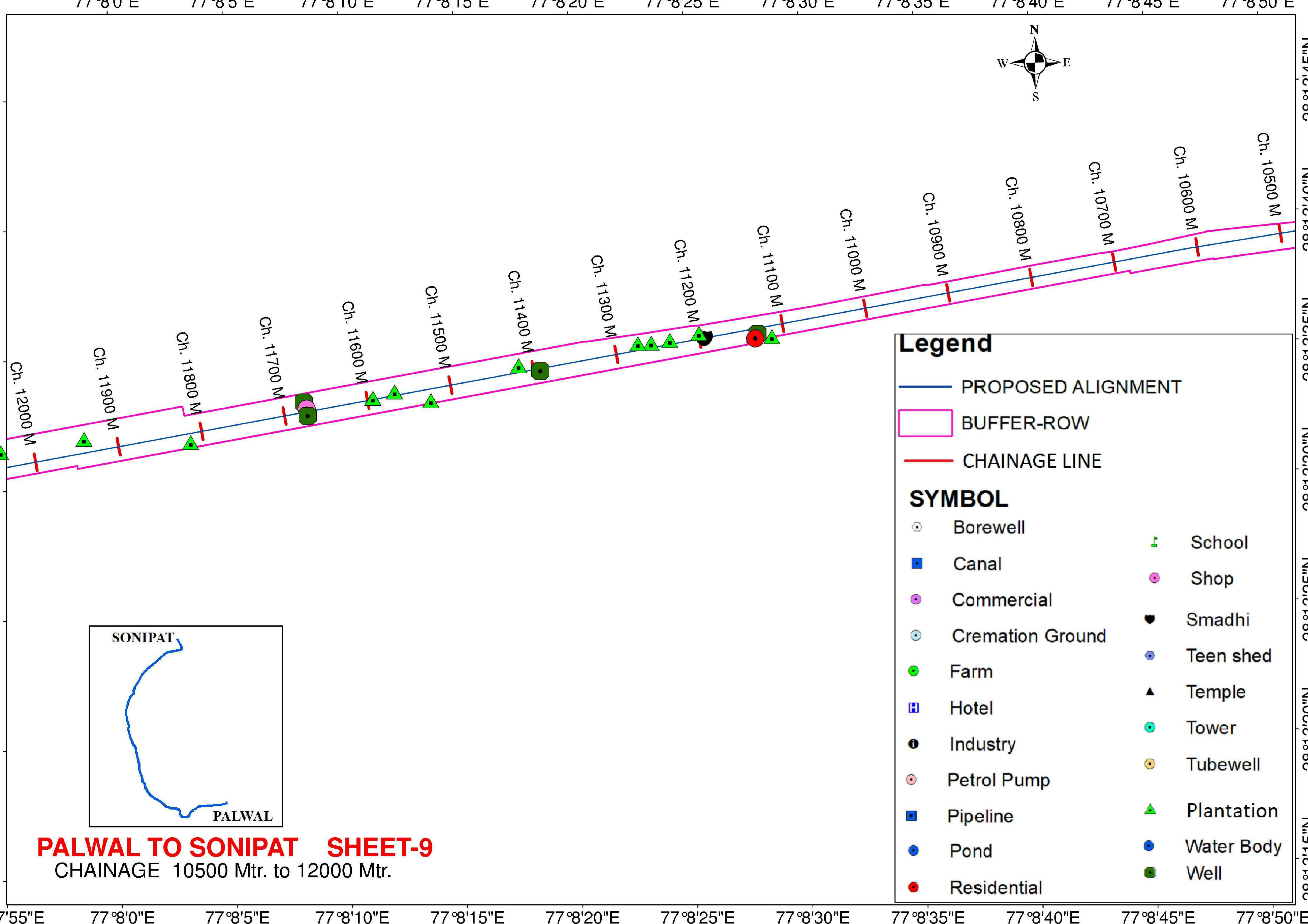
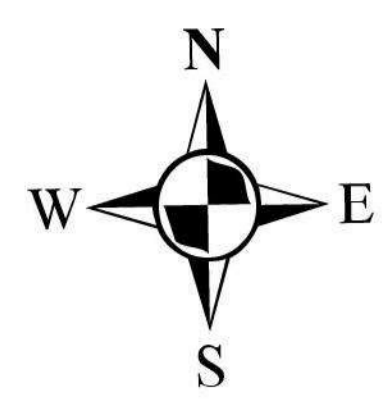
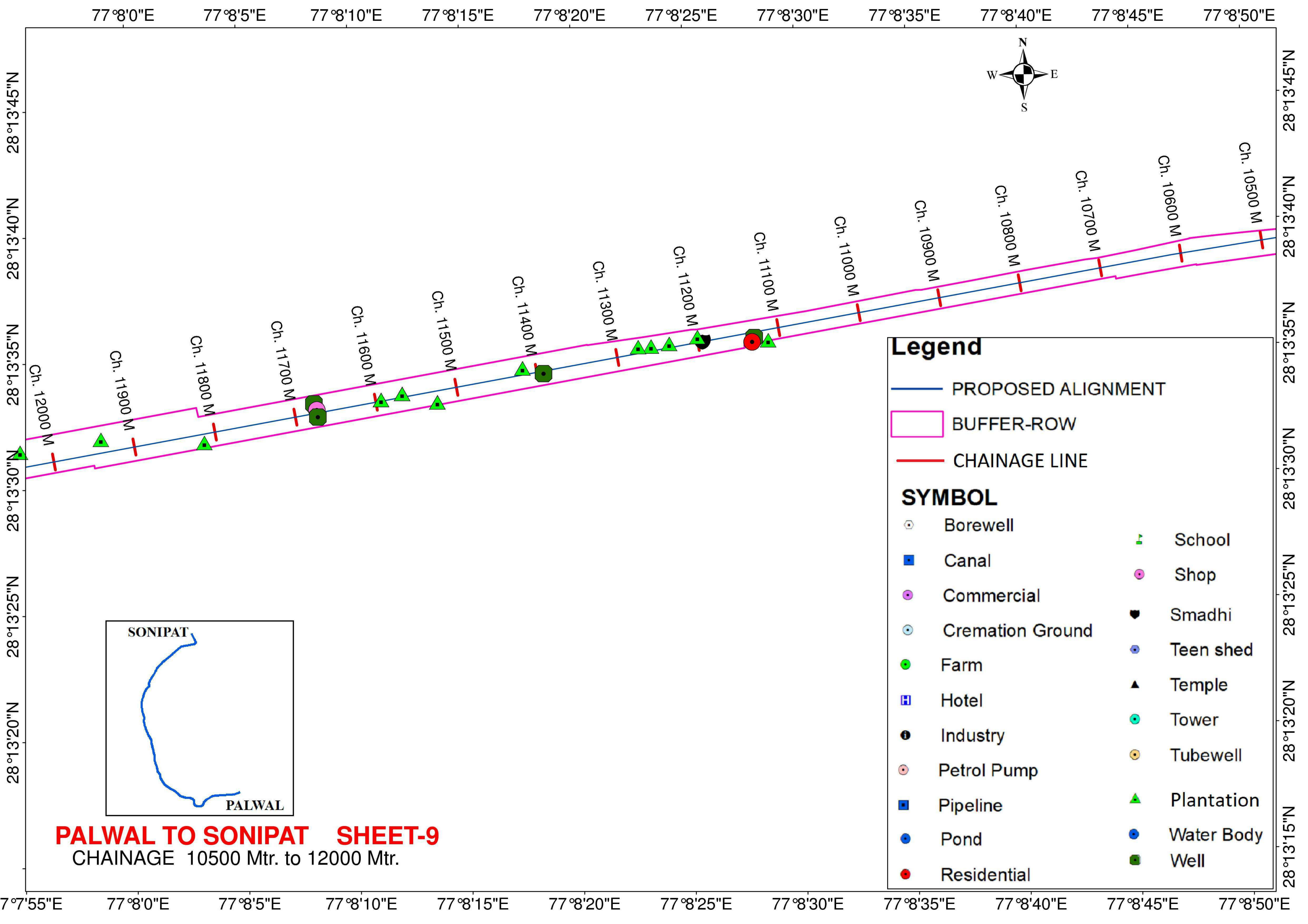
Ch. 7500 M Ch. 7400 M Ch. 7300 M Ch. 7200 M Ch. 7100 M Ch. 7000 M Ch. 6900 M Ch. 6800 M Ch. 6700 M Ch. 6600 M Ch. 6500 M Ch. 6400 M Ch. 6300 M Ch. 6200 M Ch. 6100 M Ch. 6000 M

77°10'40"E 77°10'45"E 77°10'50"E 77°10'55"E 77°11'0"E 77°11'5"E 77°11'10"E 77°11'15"E 77°11'20"E 77°11'25"E 77°11'30"E 77°11'35"E

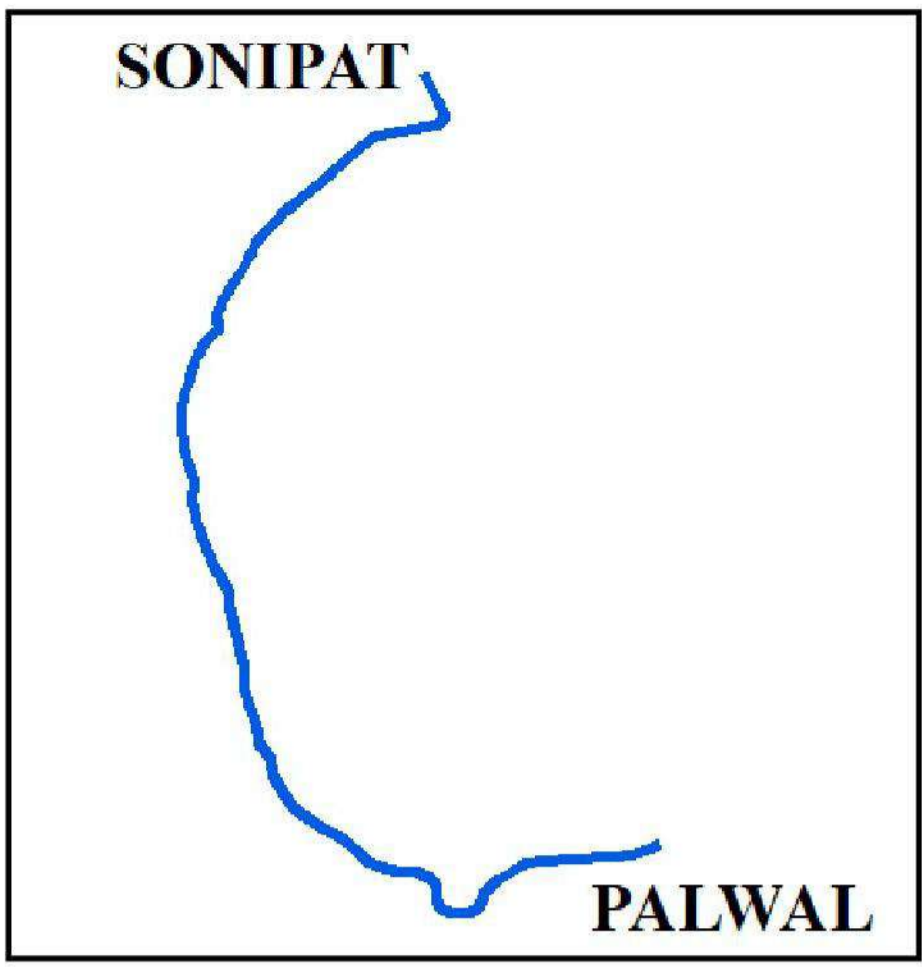
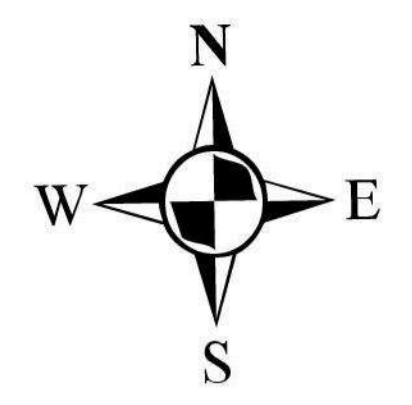
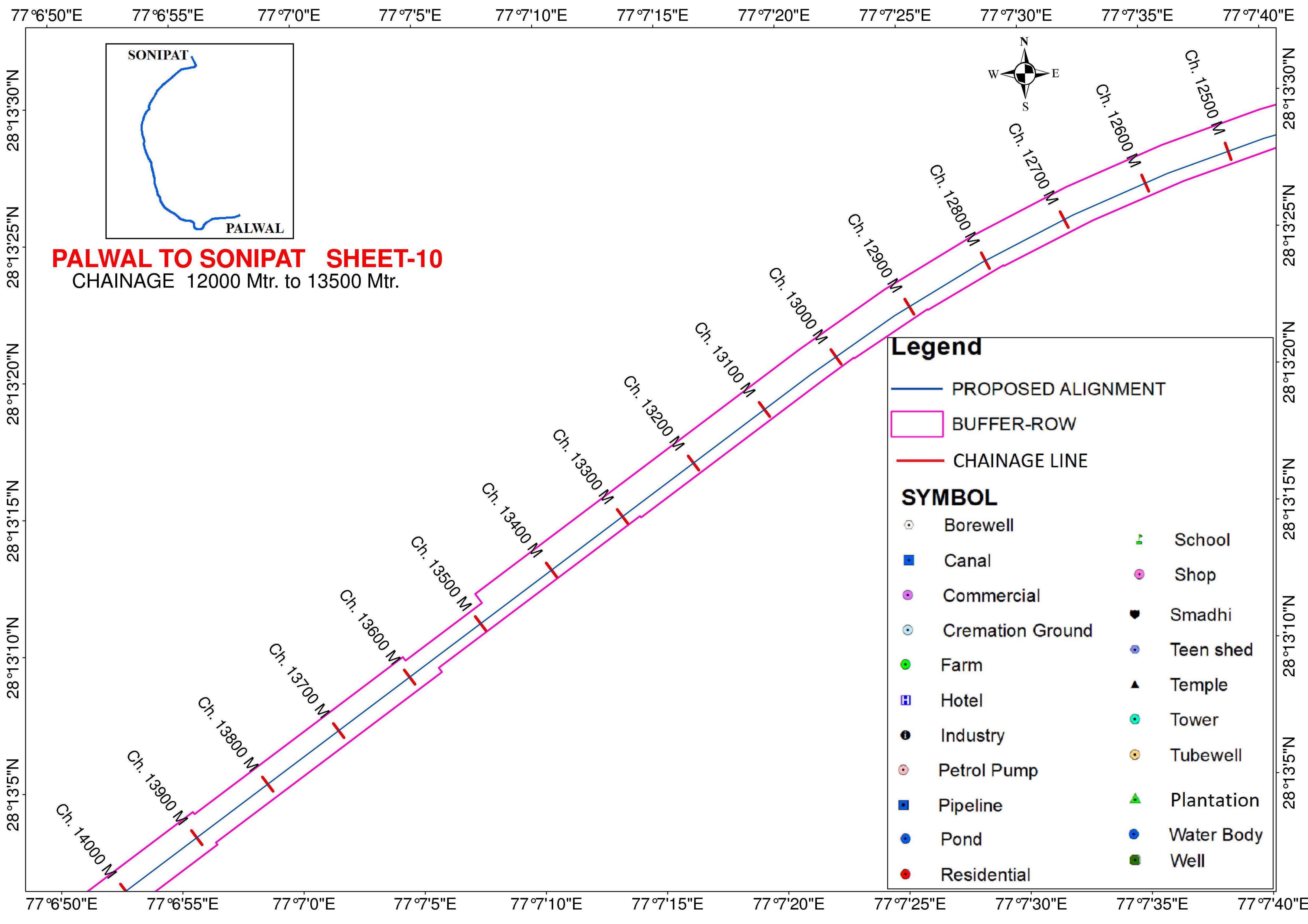
28°13'30"N 28°13'35"N 28°13'40"N 28°13'45"N 28°13'50"N 28°13'55"N







PALWAL TO SONIPAT SHEET-9
CHAINAGE 10500 Mtr. to 12000 Mtr.



PALWAL TO SONIPAT SHEET-10
CHAINAGE 12000 Mtr. to 13500 Mtr.

Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

○ Borewell	▤ School
■ Canal	○ Shop
○ Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
ⓘ Industry	○ Tubewell
○ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

Ch. 14000 M

Ch. 13900 M

Ch. 13800 M

Ch. 13700 M

Ch. 13600 M

Ch. 13500 M

Ch. 13400 M

Ch. 13300 M

Ch. 13200 M

Ch. 13100 M

Ch. 13000 M

Ch. 12900 M

Ch. 12800 M

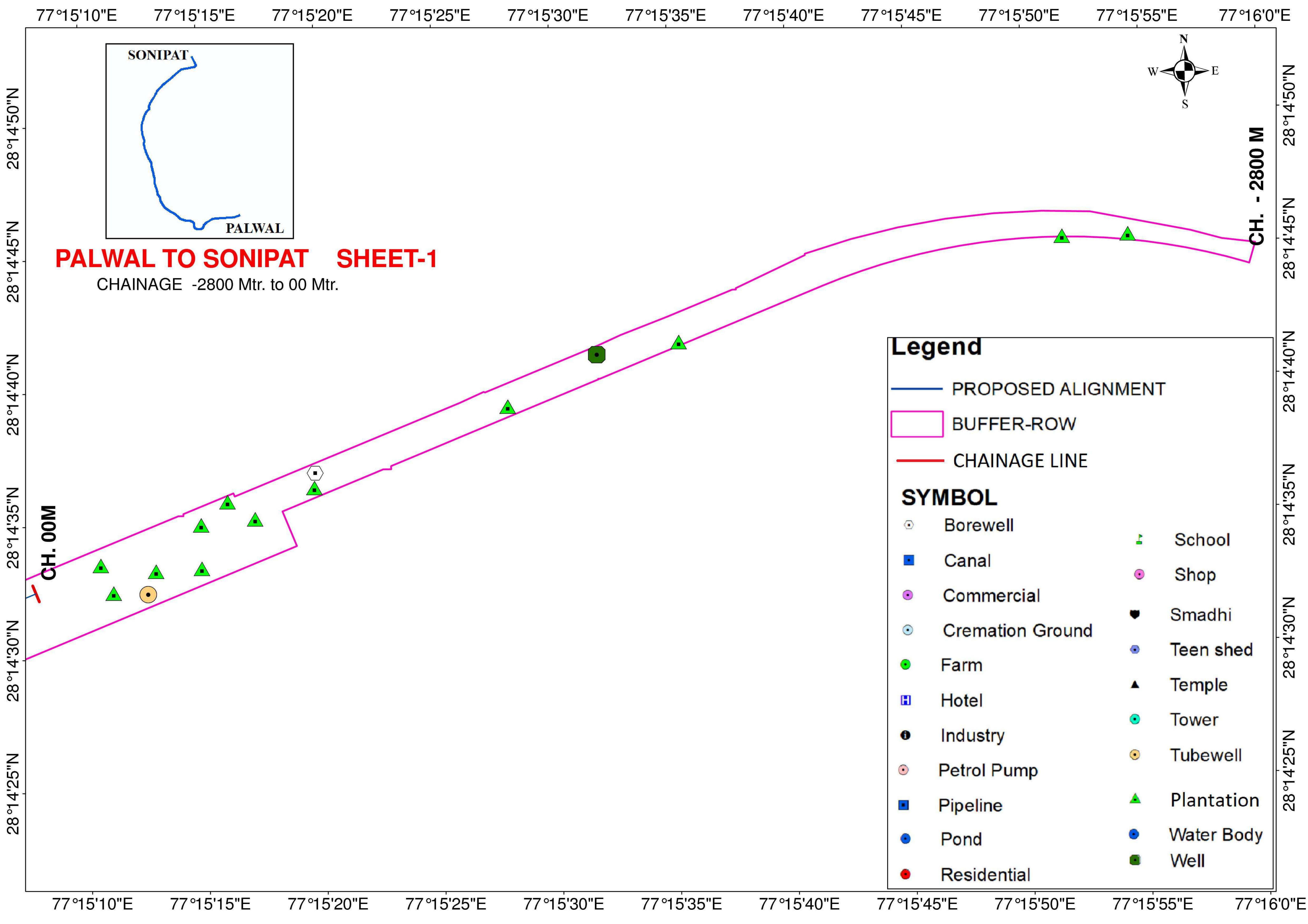
Ch. 12700 M

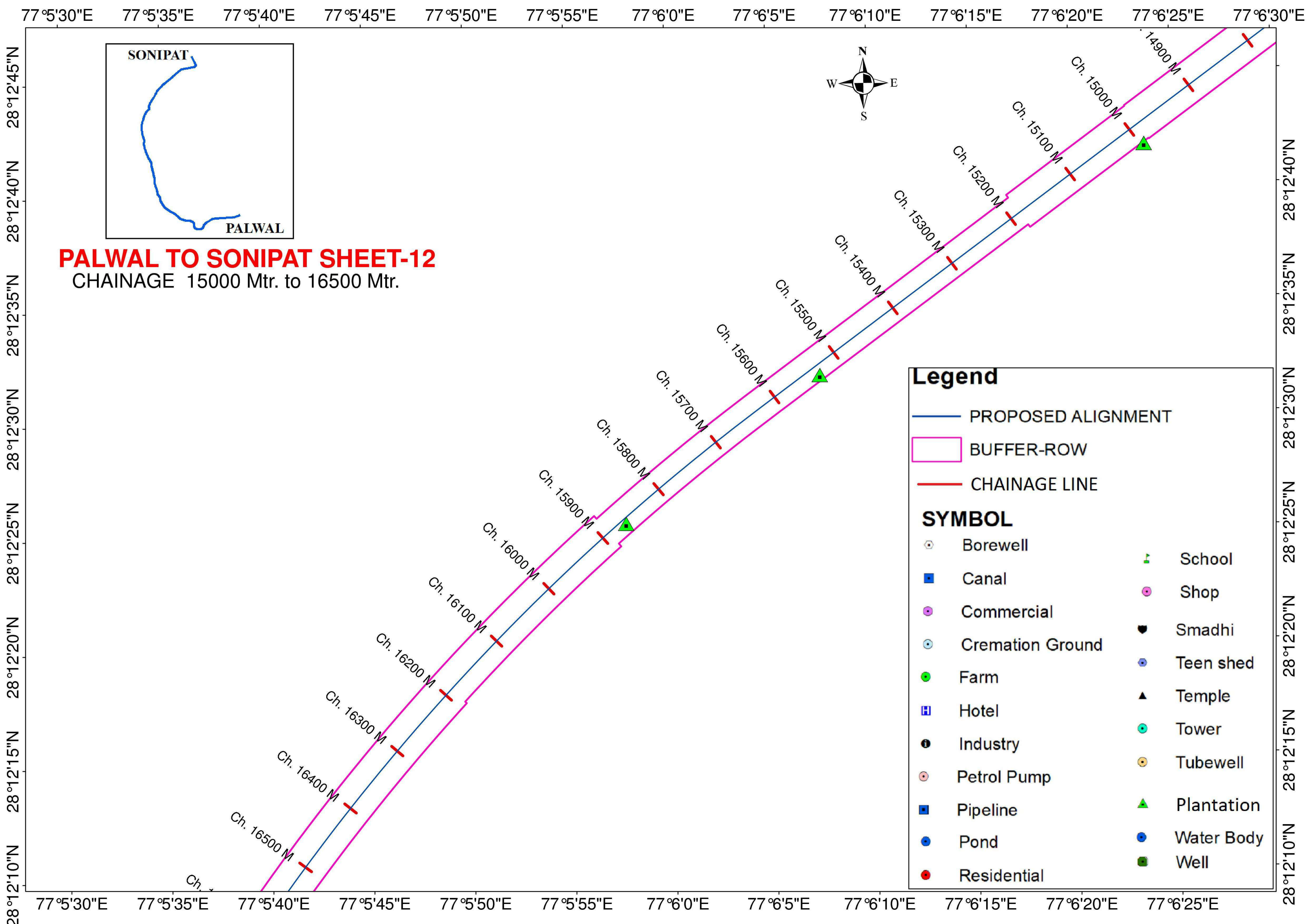
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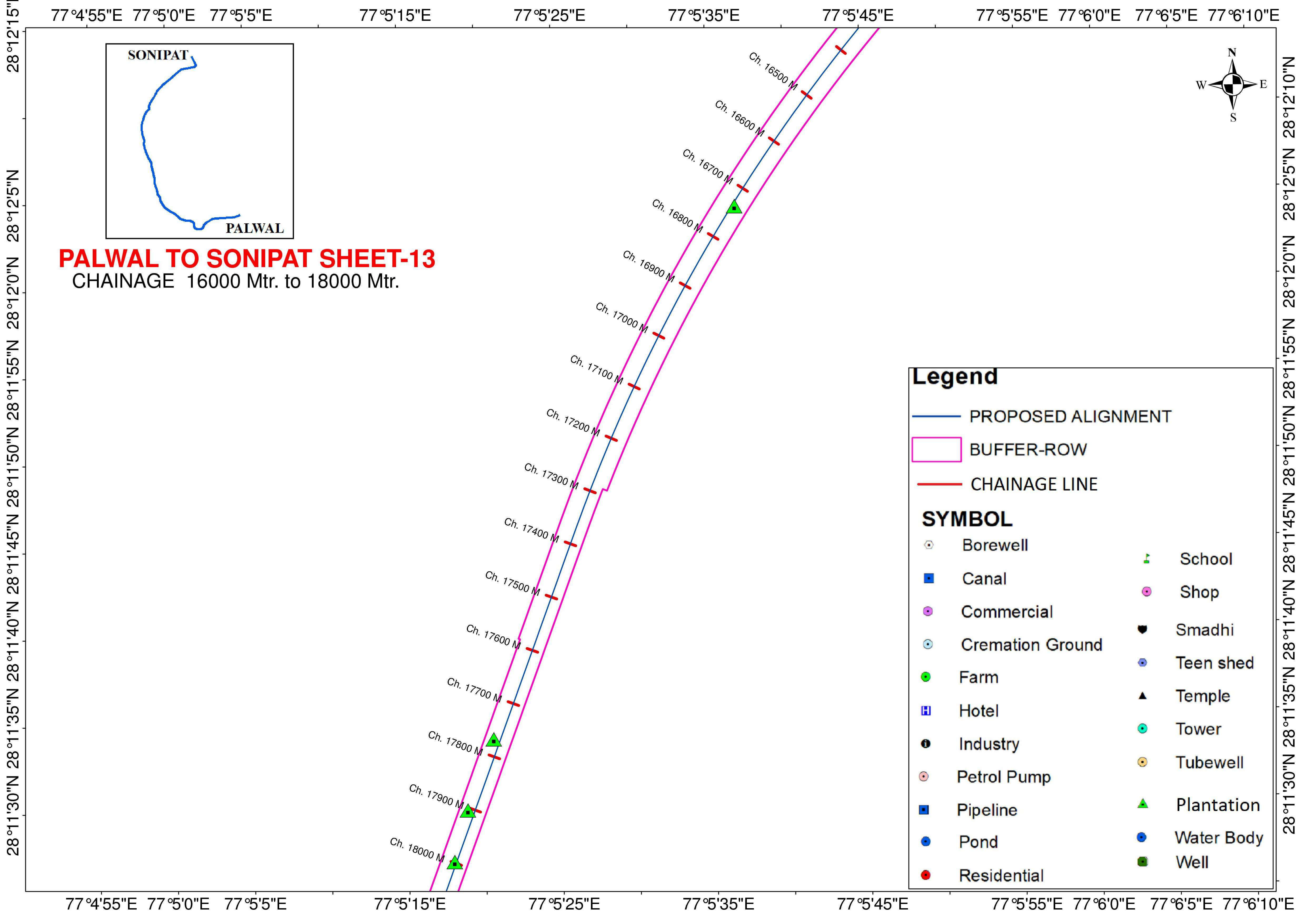
Ch. 12500 M

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28°13'5"N 28°13'10"N 28°13'15"N 28°13'20"N 28°13'25"N 28°13'30"N







77°4'55"E 77°5'0"E 77°5'5"E

77°5'15"E

77°5'25"E

77°5'35"E

77°5'45"E

77°5'55"E

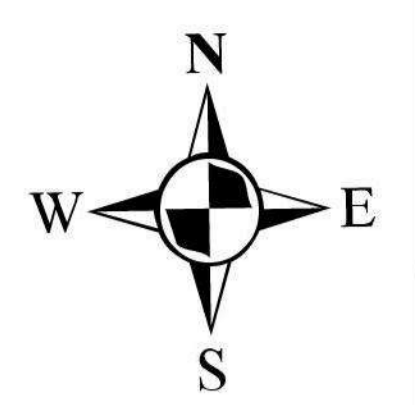
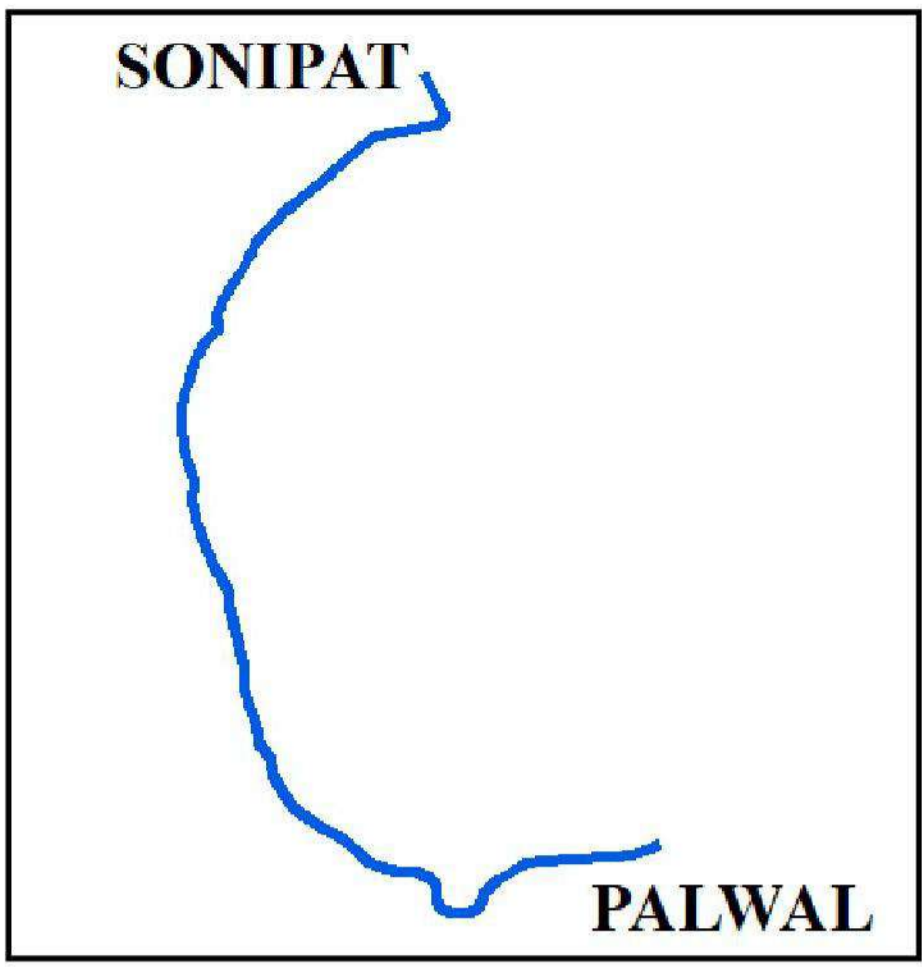
77°6'0"E

77°6'5"E

77°6'10"E

28°12'15"N
28°12'5"N
28°12'0"N
28°11'55"N
28°11'50"N
28°11'45"N
28°11'40"N
28°11'35"N
28°11'30"N

28°12'10"N
28°12'5"N
28°12'0"N
28°11'55"N
28°11'50"N
28°11'45"N
28°11'40"N
28°11'35"N
28°11'30"N



PALWAL TO SONIPAT SHEET-13
CHAINAGE 16000 Mtr. to 18000 Mtr.

Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	⬛ Smadhi
⊙ Cremation Ground	⬢ Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	● Tubewell
⊙ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

77°4'55"E 77°5'0"E 77°5'5"E

77°5'15"E

77°5'25"E

77°5'35"E

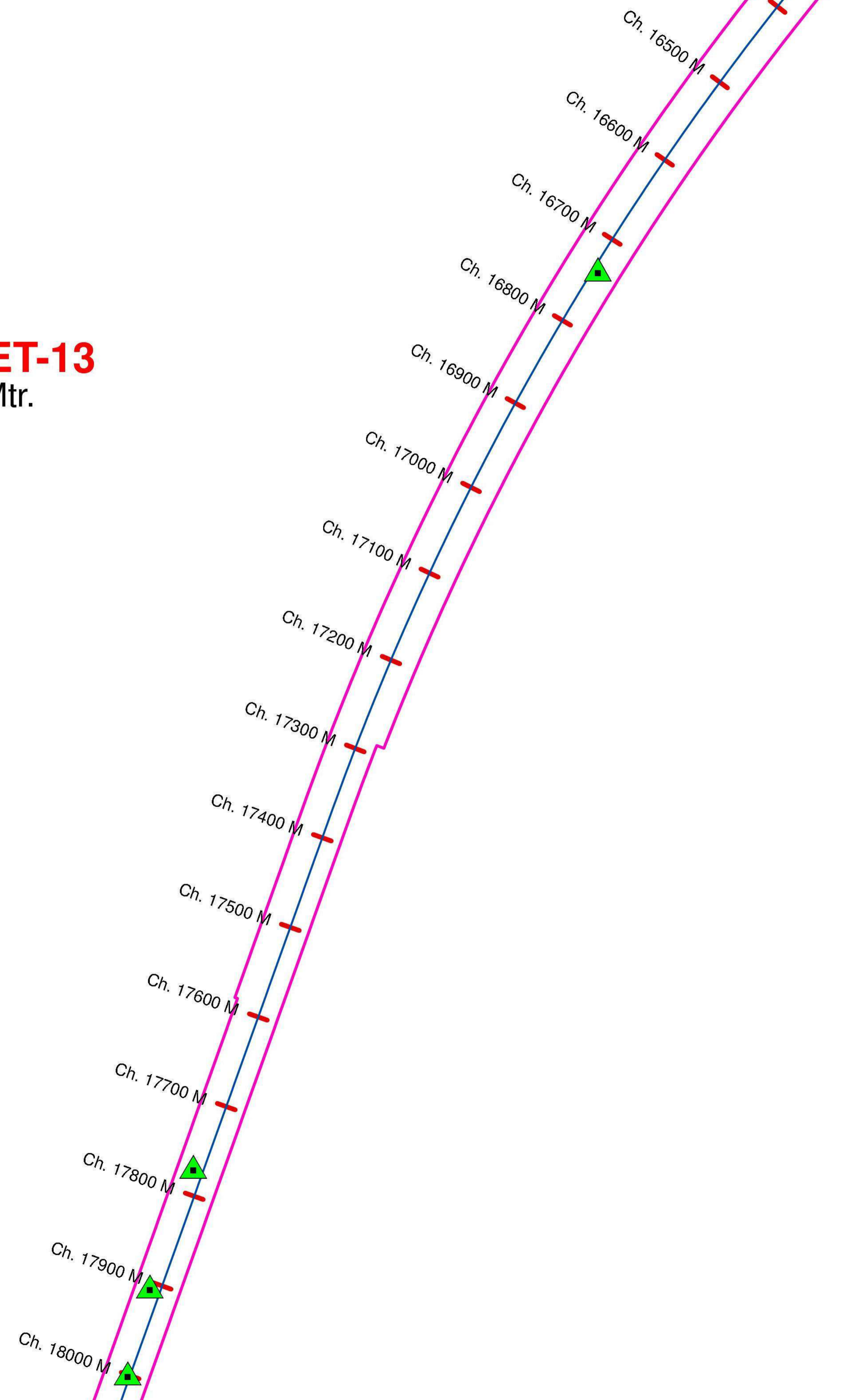
77°5'45"E

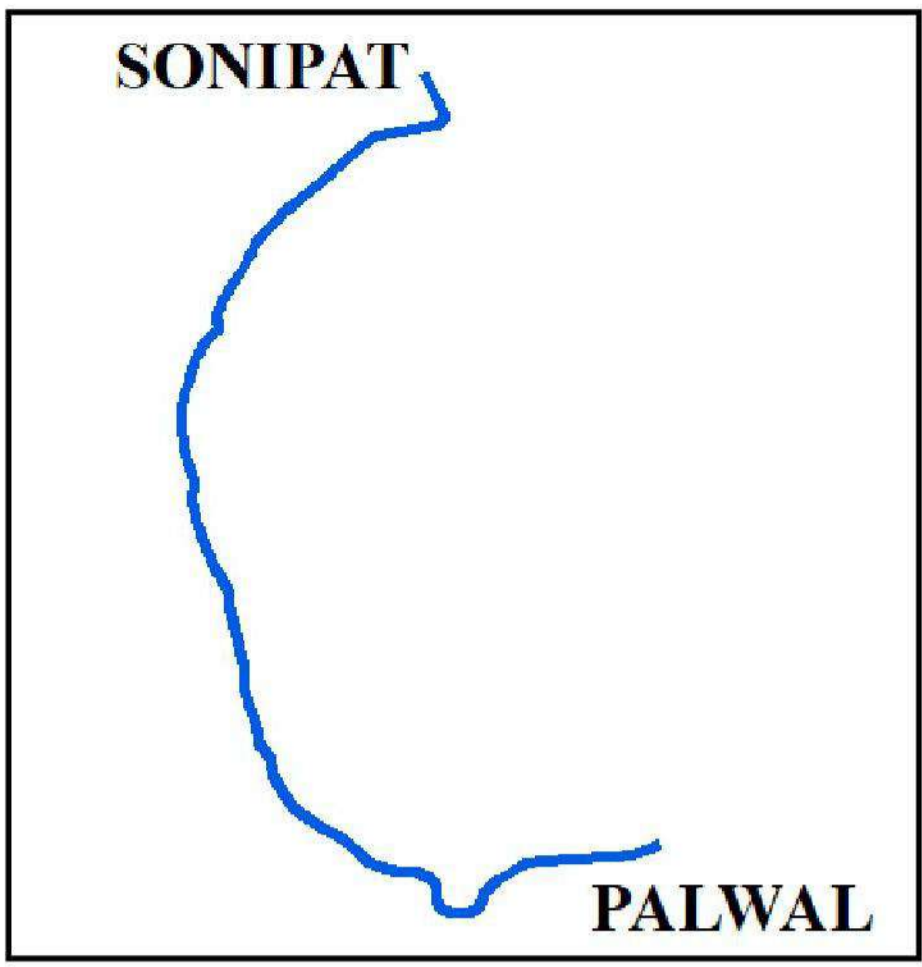
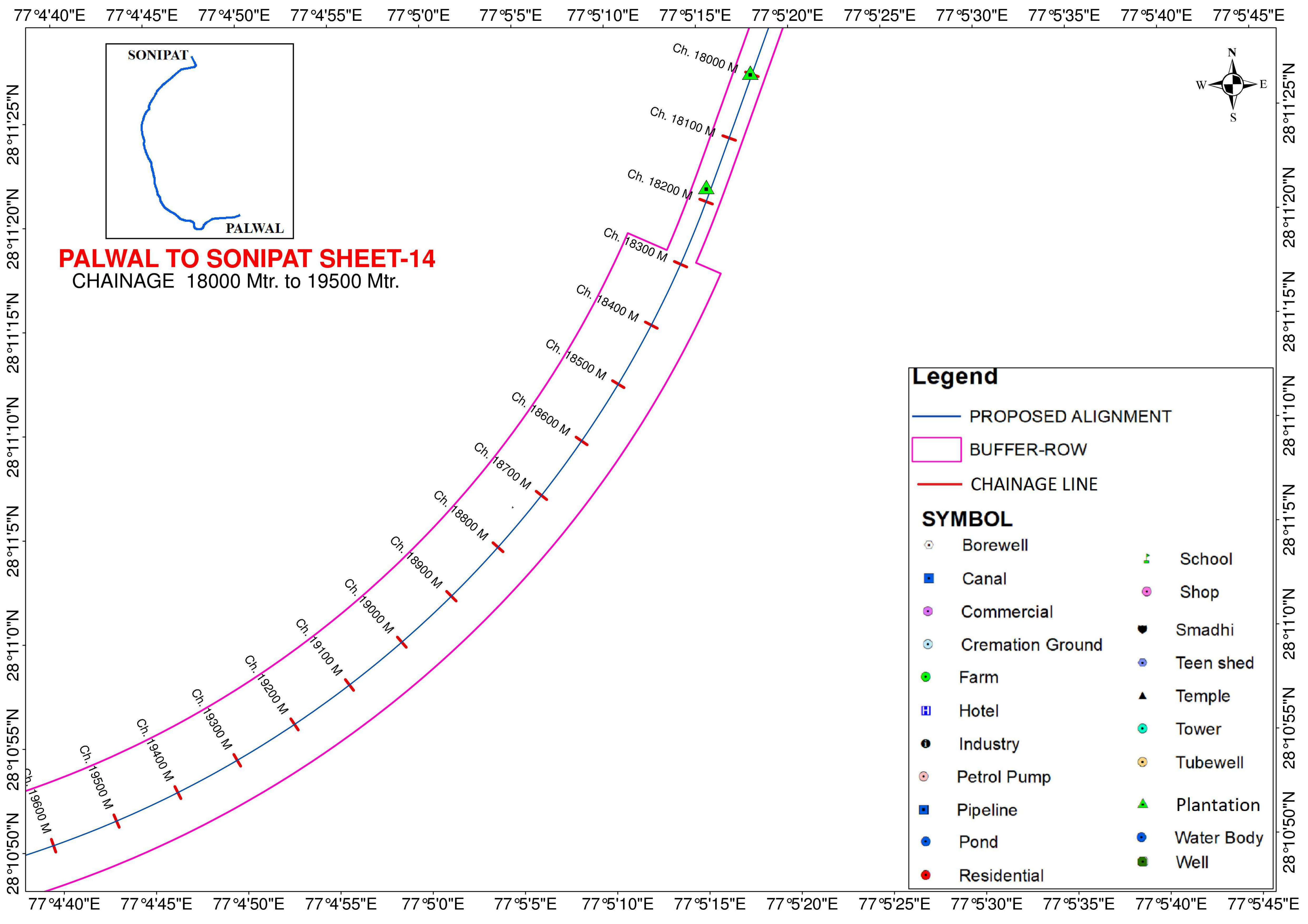
77°5'55"E

77°6'0"E

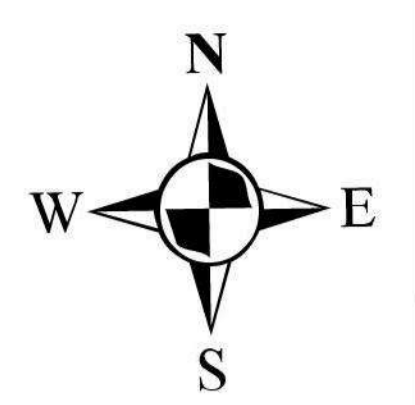
77°6'5"E

77°6'10"E





PALWAL TO SONIPAT SHEET-14
CHAINAGE 18000 Mtr. to 19500 Mtr.

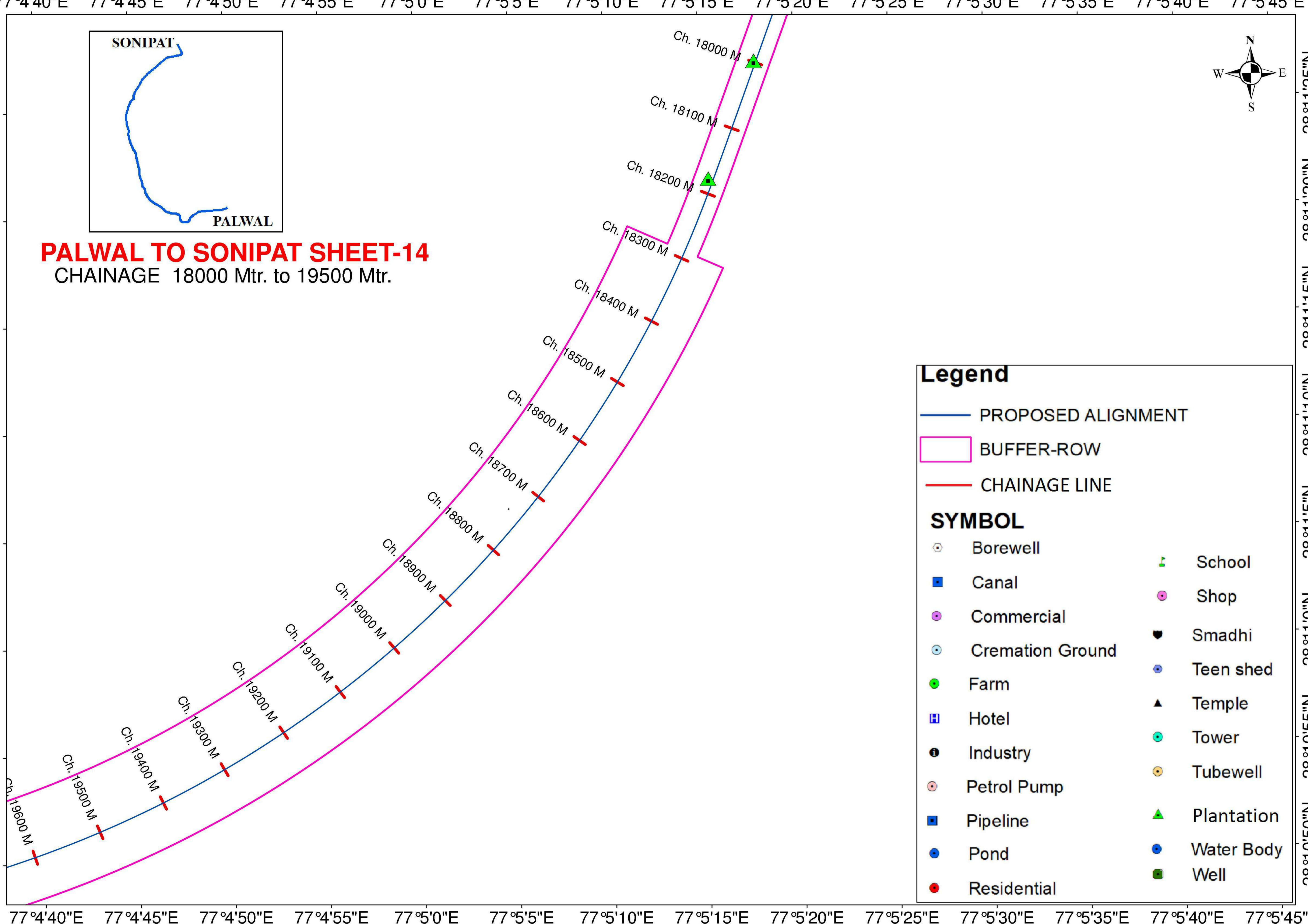


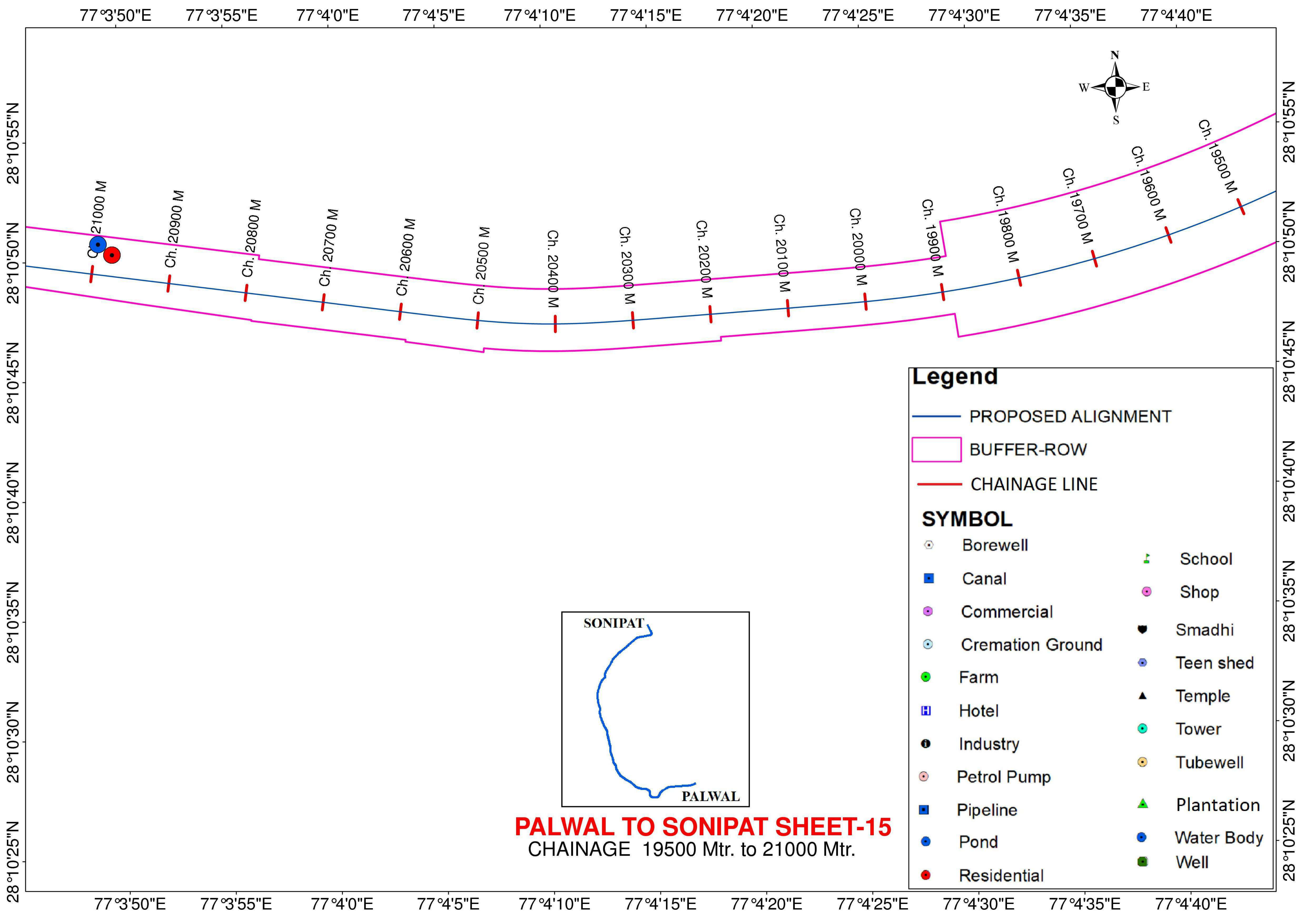
Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

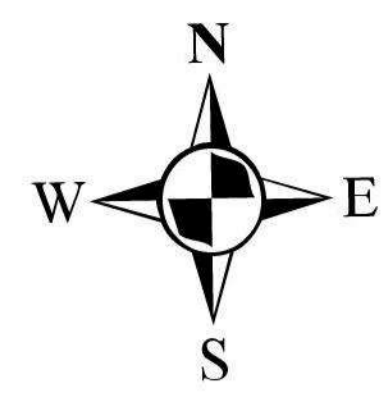
⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	● Tubewell
⊙ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	





77°3'50"E 77°3'55"E 77°4'0"E 77°4'5"E 77°4'10"E 77°4'15"E 77°4'20"E 77°4'25"E 77°4'30"E 77°4'35"E 77°4'40"E

28°10'55"N
28°10'50"N
28°10'45"N
28°10'40"N
28°10'35"N
28°10'30"N
28°10'25"N

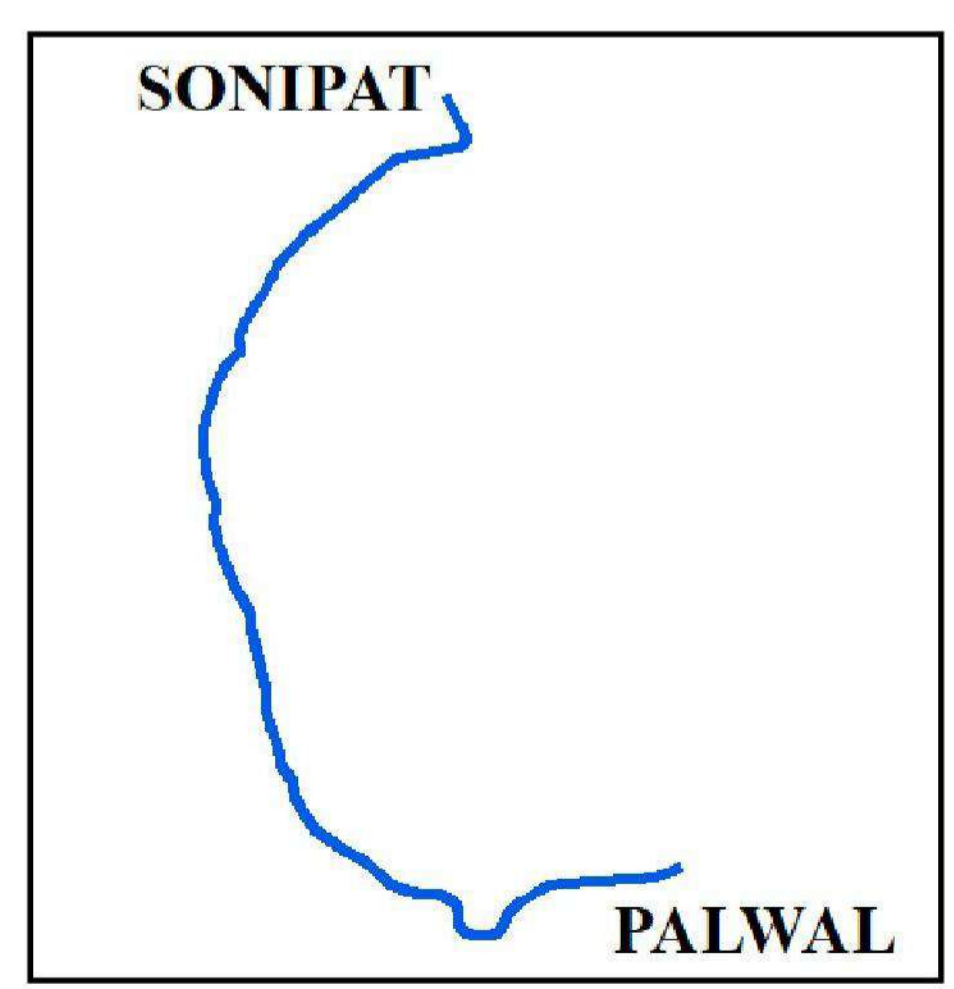


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

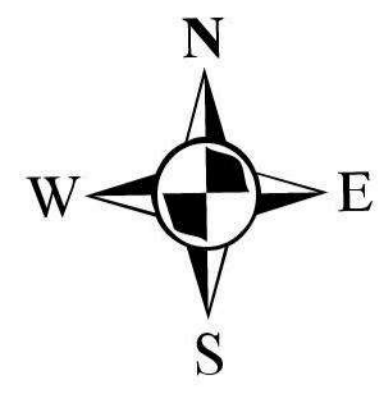
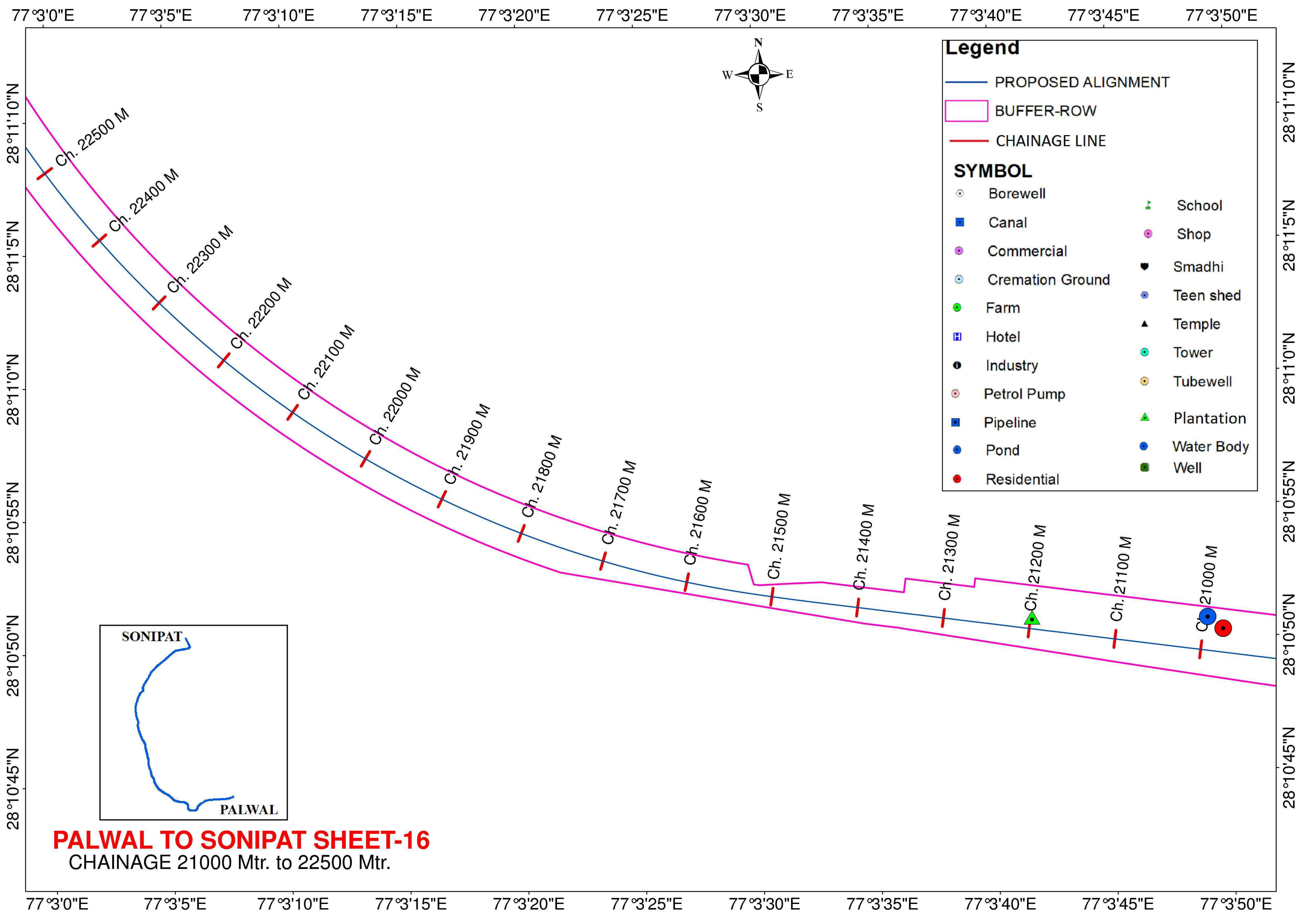
⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
⊙ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-15
CHAINAGE 19500 Mtr. to 21000 Mtr.

77°3'50"E 77°3'55"E 77°4'0"E 77°4'5"E 77°4'10"E 77°4'15"E 77°4'20"E 77°4'25"E 77°4'30"E 77°4'35"E 77°4'40"E

28°10'55"N
28°10'50"N
28°10'45"N
28°10'40"N
28°10'35"N
28°10'30"N
28°10'25"N

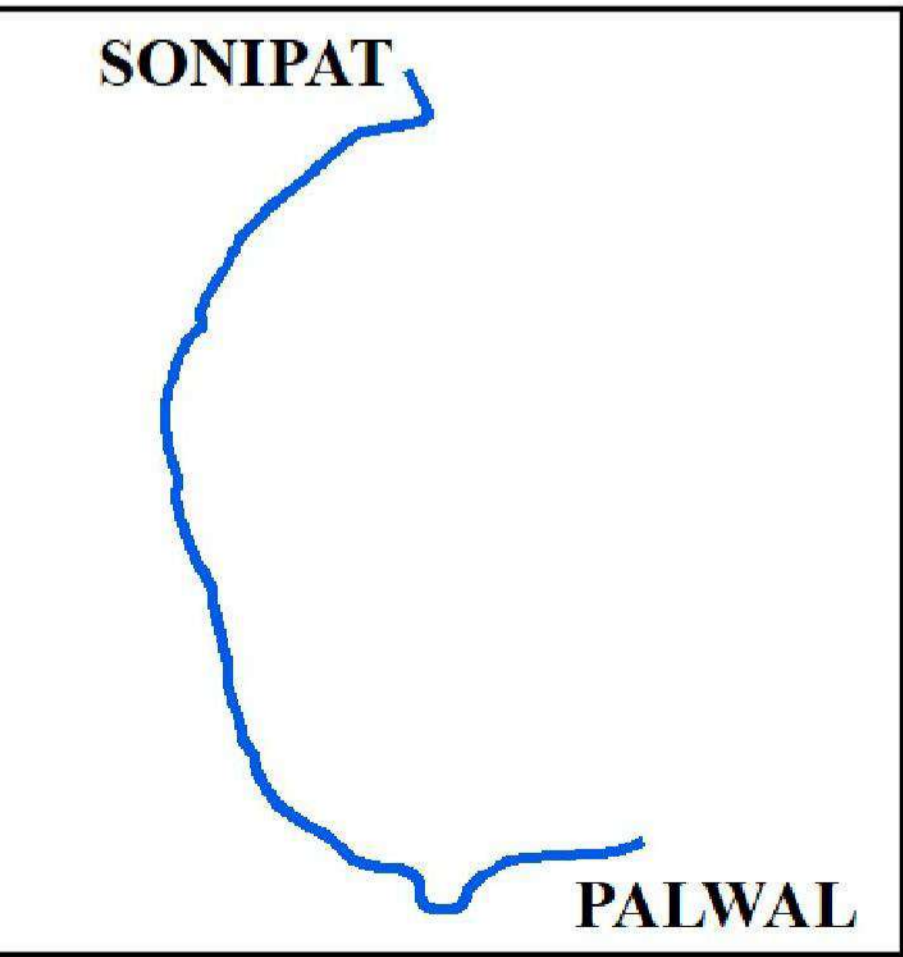


Legend

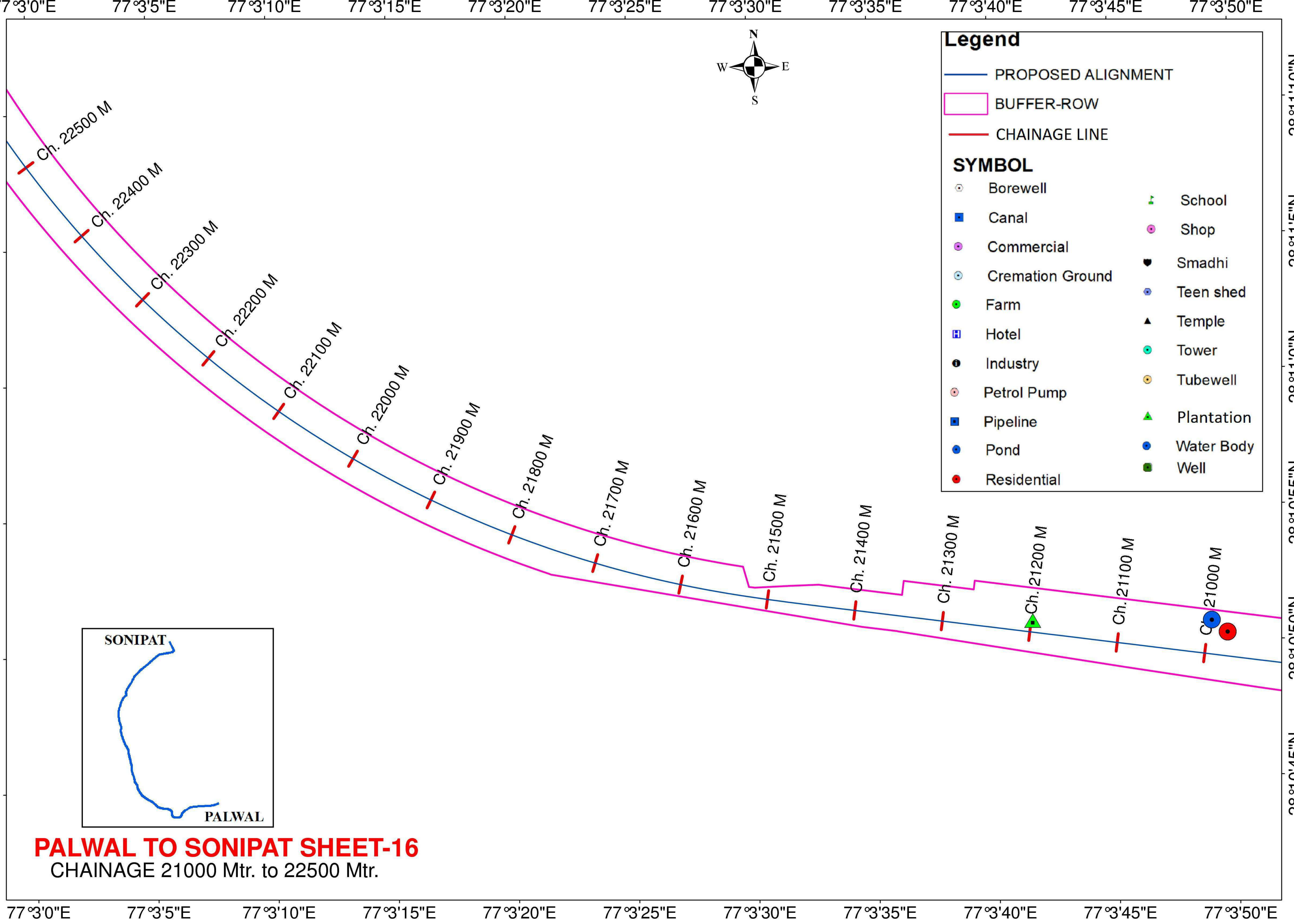
- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

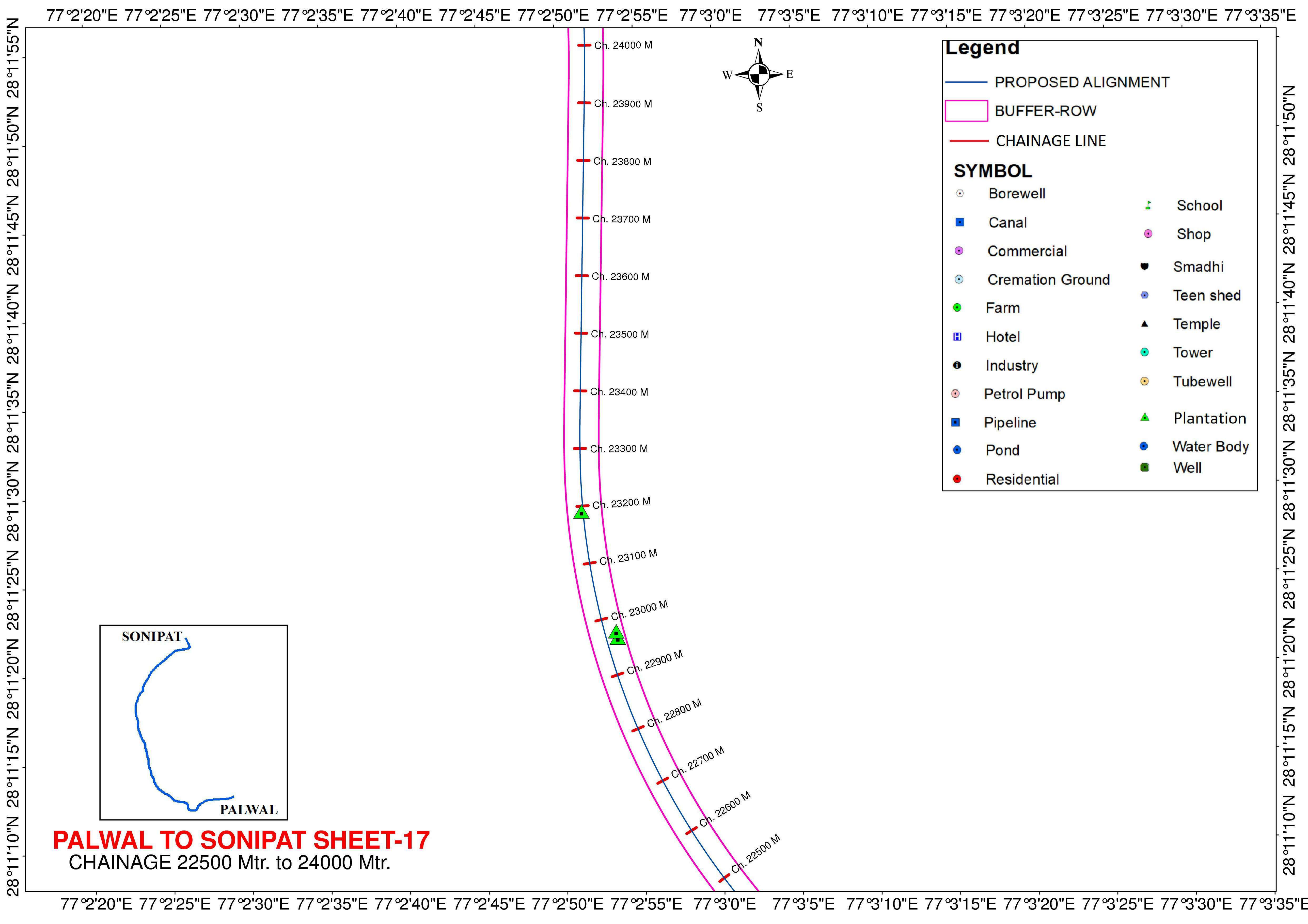
SYMBOL

- Borewell
- Canal
- Commercial
- Cremation Ground
- Farm
- Hotel
- Industry
- Petrol Pump
- Pipeline
- Pond
- Residential
- School
- Shop
- Smadhi
- Teen shed
- Temple
- Tower
- Tubewell
- Plantation
- Water Body
- Well



PALWAL TO SONIPAT SHEET-16
CHAINAGE 21000 Mtr. to 22500 Mtr.





77°2'20"E 77°2'25"E 77°2'30"E 77°2'35"E 77°2'40"E 77°2'45"E 77°2'50"E 77°2'55"E 77°3'0"E 77°3'5"E 77°3'10"E 77°3'15"E 77°3'20"E 77°3'25"E 77°3'30"E 77°3'35"E

28°11'10"N 28°11'15"N 28°11'20"N 28°11'25"N 28°11'30"N 28°11'35"N 28°11'40"N 28°11'45"N 28°11'50"N 28°11'55"N

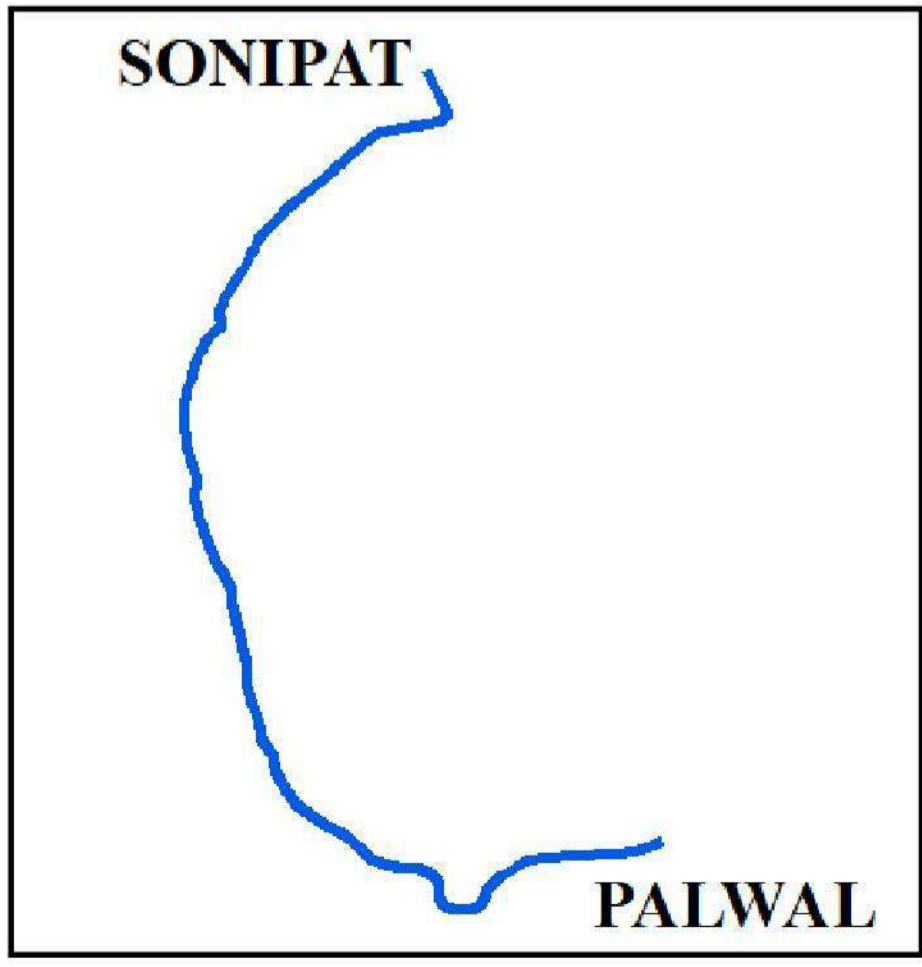
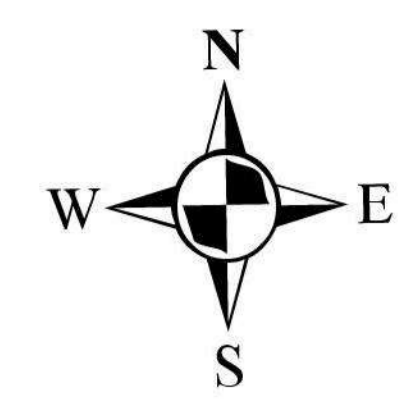
28°11'10"N 28°11'15"N 28°11'20"N 28°11'25"N 28°11'30"N 28°11'35"N 28°11'40"N 28°11'45"N 28°11'50"N

Legend

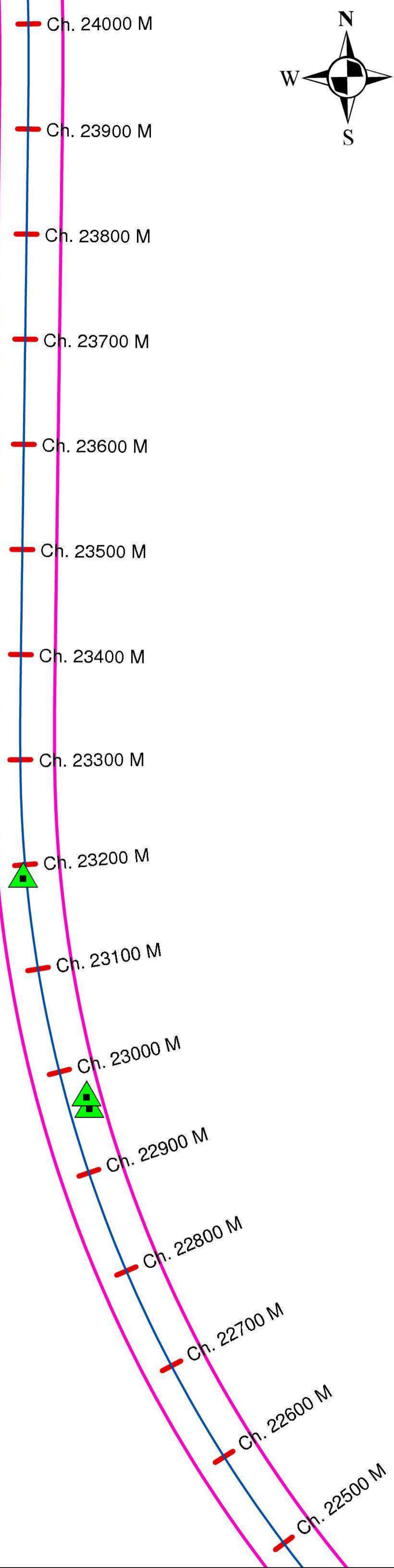
- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

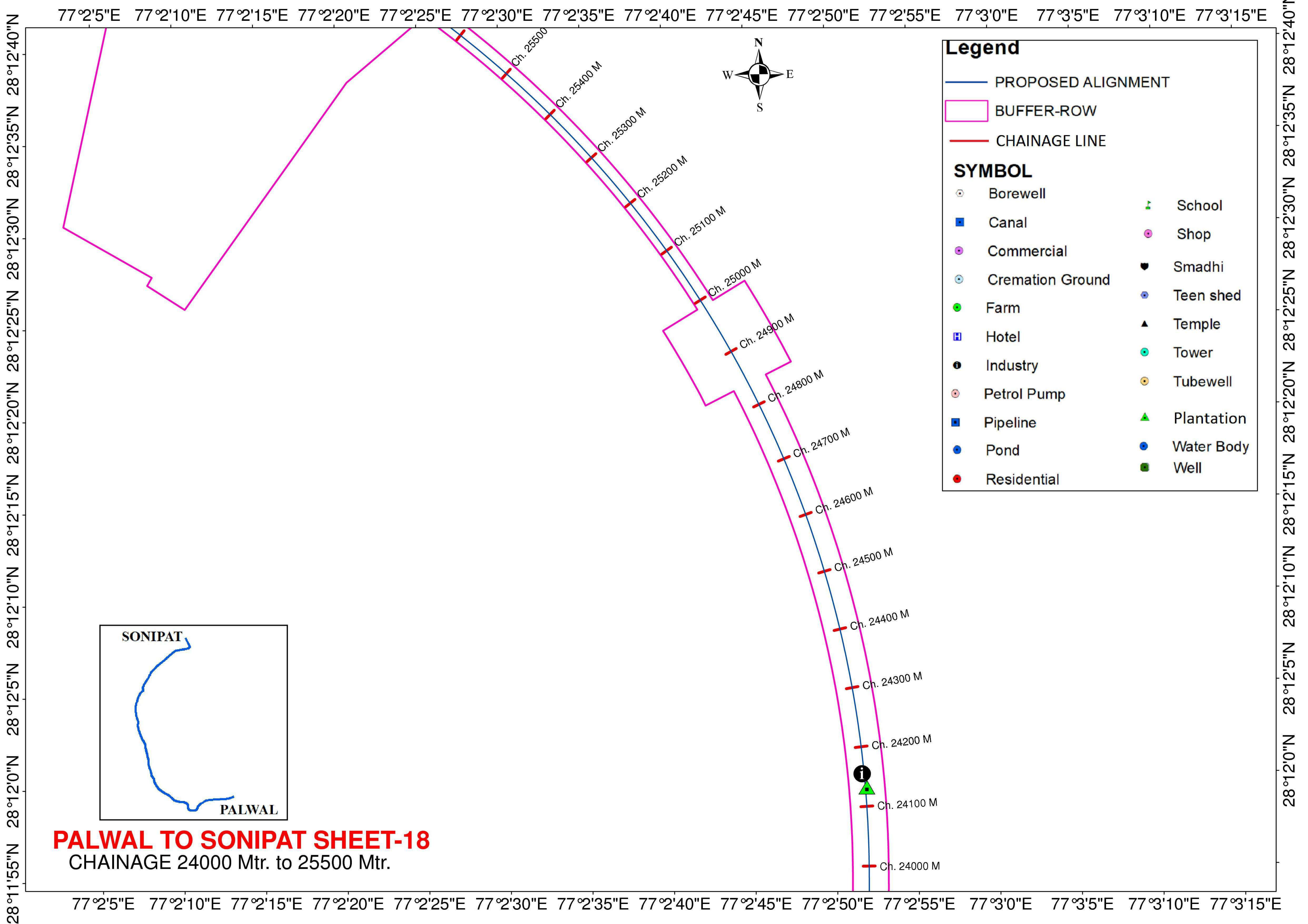
○ Borewell	▲ School
■ Canal	● Shop
● Commercial	■ Smadhi
○ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-17
CHAINAGE 22500 Mtr. to 24000 Mtr.



77°2'20"E 77°2'25"E 77°2'30"E 77°2'35"E 77°2'40"E 77°2'45"E 77°2'50"E 77°2'55"E 77°3'0"E 77°3'5"E 77°3'10"E 77°3'15"E 77°3'20"E 77°3'25"E 77°3'30"E 77°3'35"E

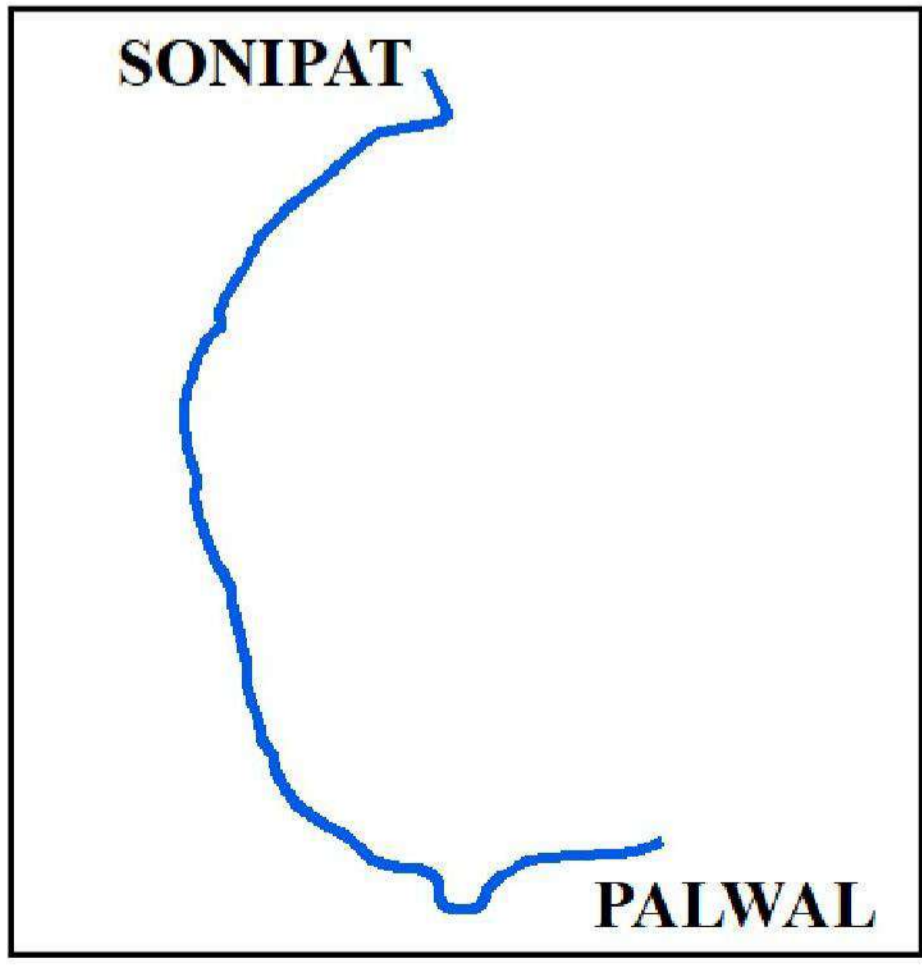


Legend

— PROPOSED ALIGNMENT
 BUFFER-ROW
- - - CHAINAGE LINE

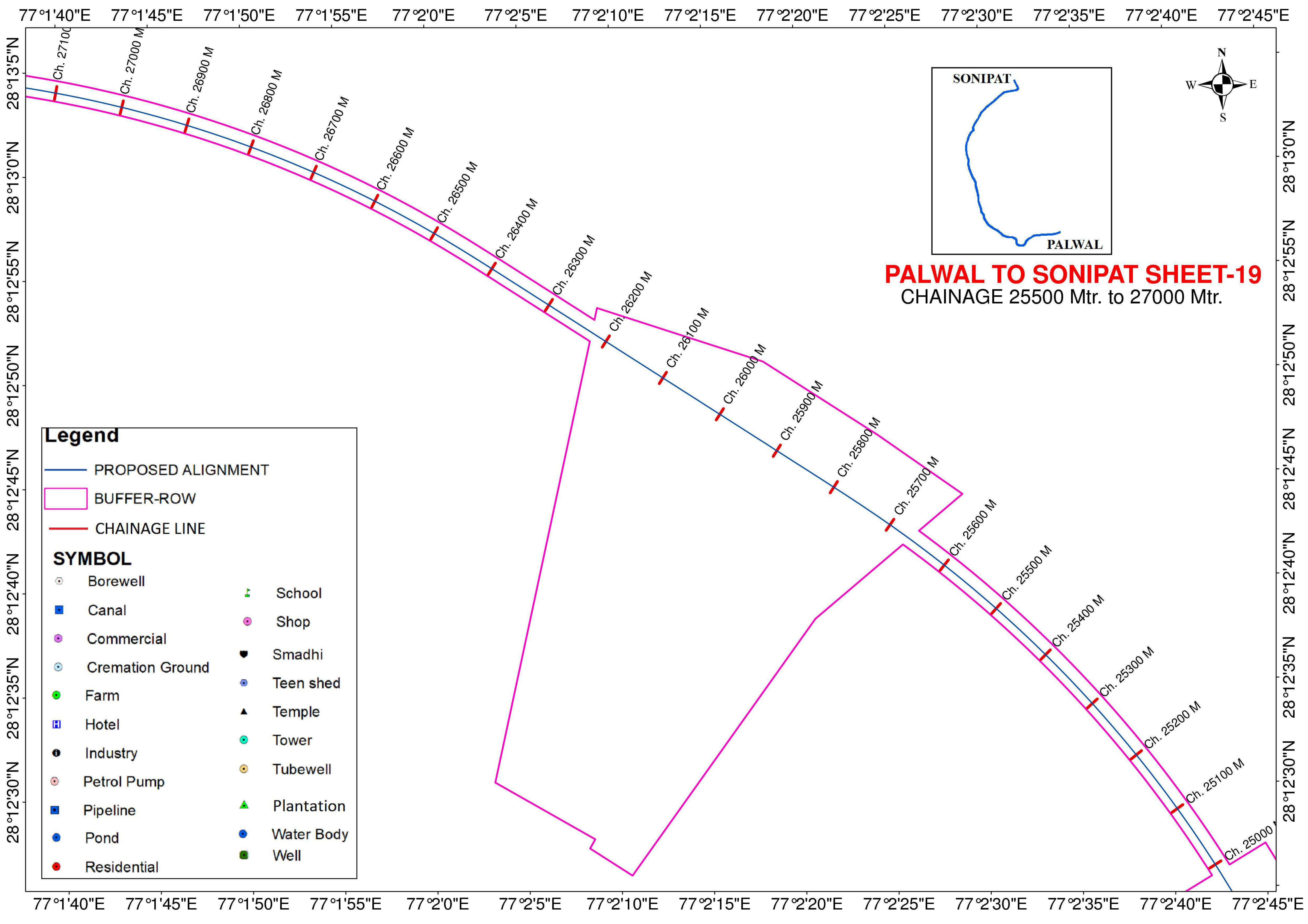
SYMBOL

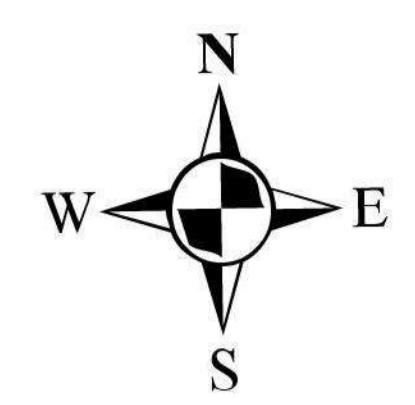
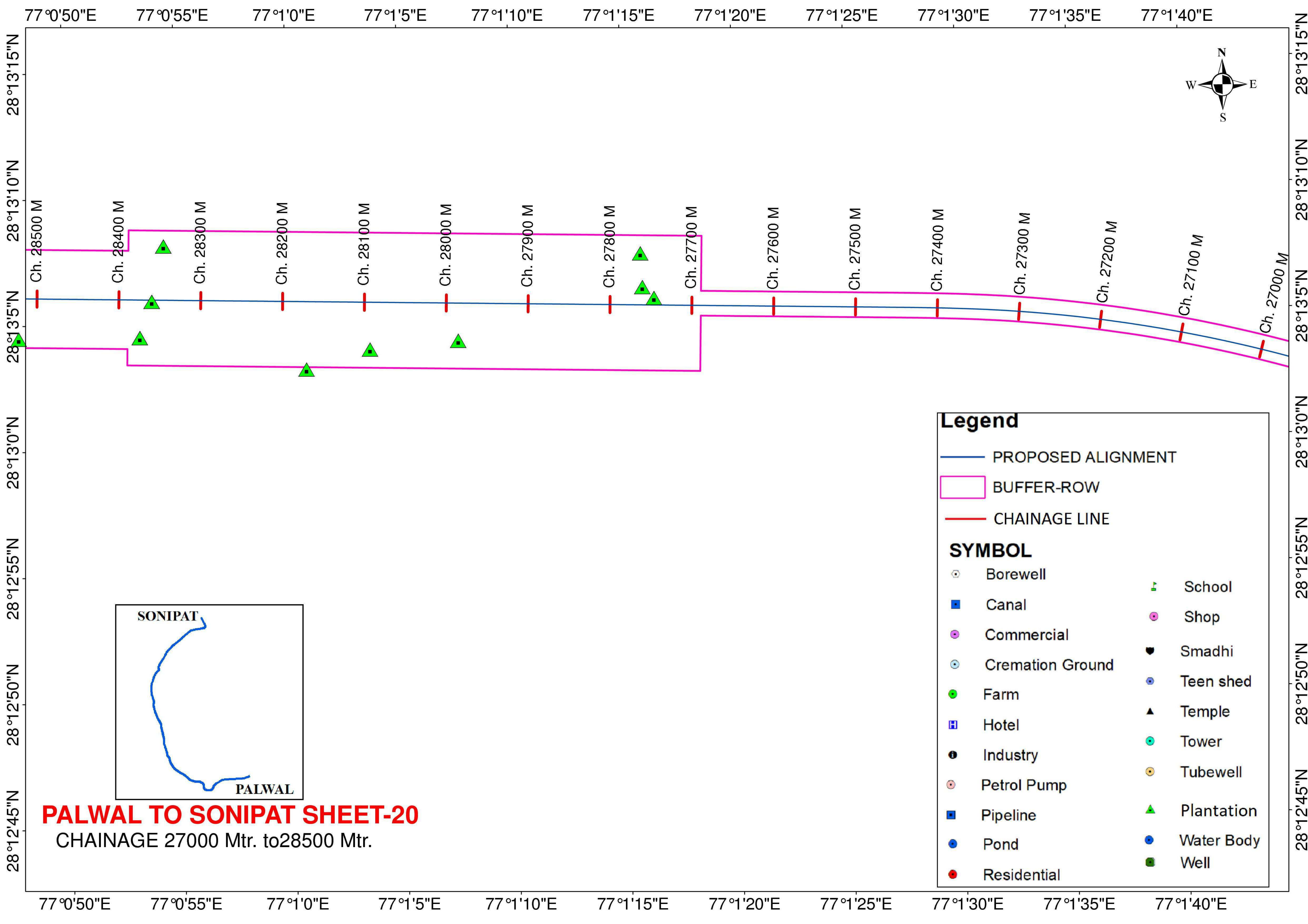
○ Borewell	▲ School
■ Canal	● Shop
● Commercial	■ Smadhi
○ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-18
 CHAINAGE 24000 Mtr. to 25500 Mtr.

Ch. 25500
 Ch. 25400 M
 Ch. 25300 M
 Ch. 25200 M
 Ch. 25100 M
 Ch. 25000 M
 Ch. 24900 M
 Ch. 24800 M
 Ch. 24700 M
 Ch. 24600 M
 Ch. 24500 M
 Ch. 24400 M
 Ch. 24300 M
 Ch. 24200 M
 Ch. 24100 M
 Ch. 24000 M



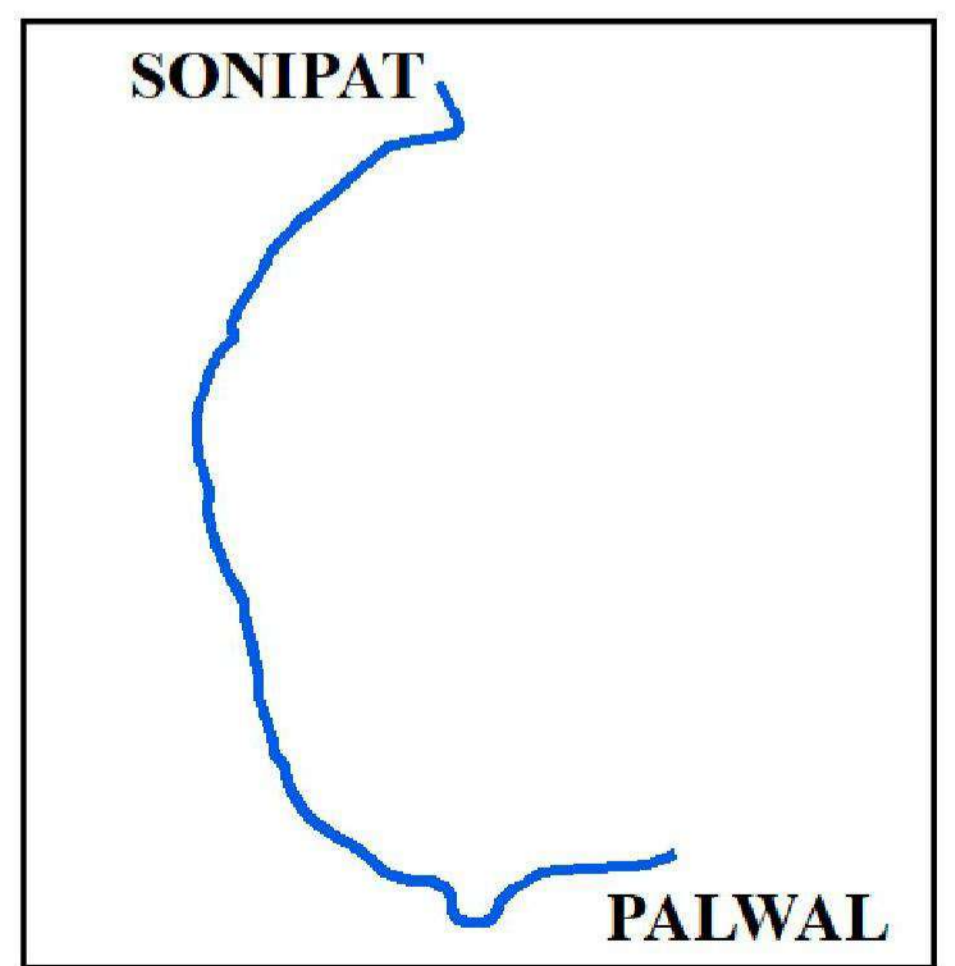


Legend

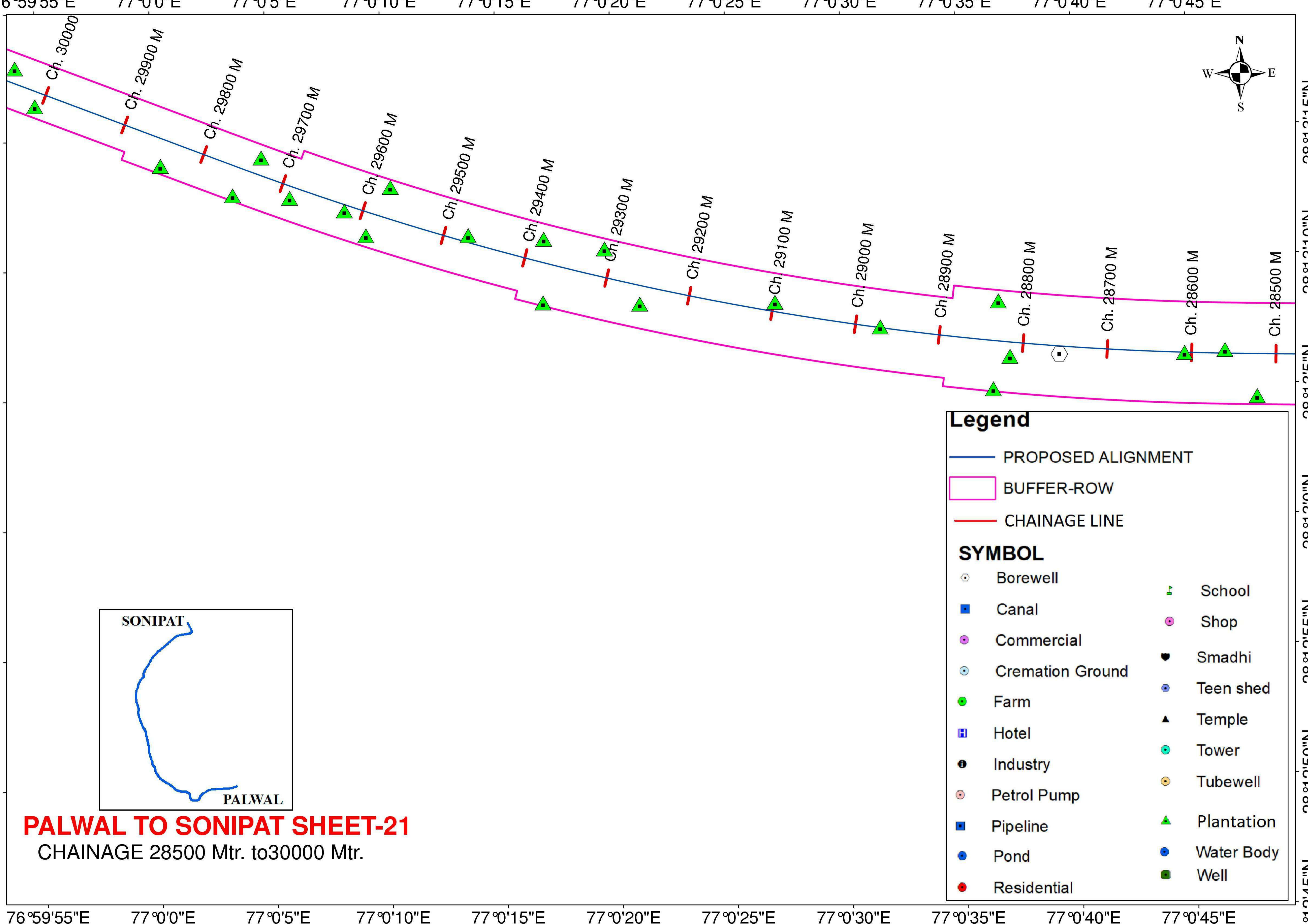
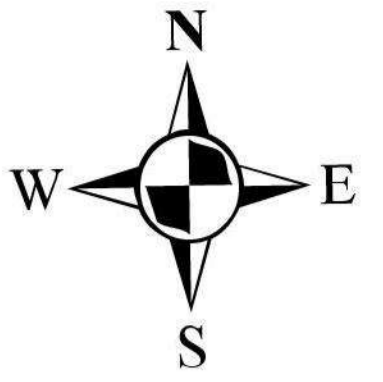
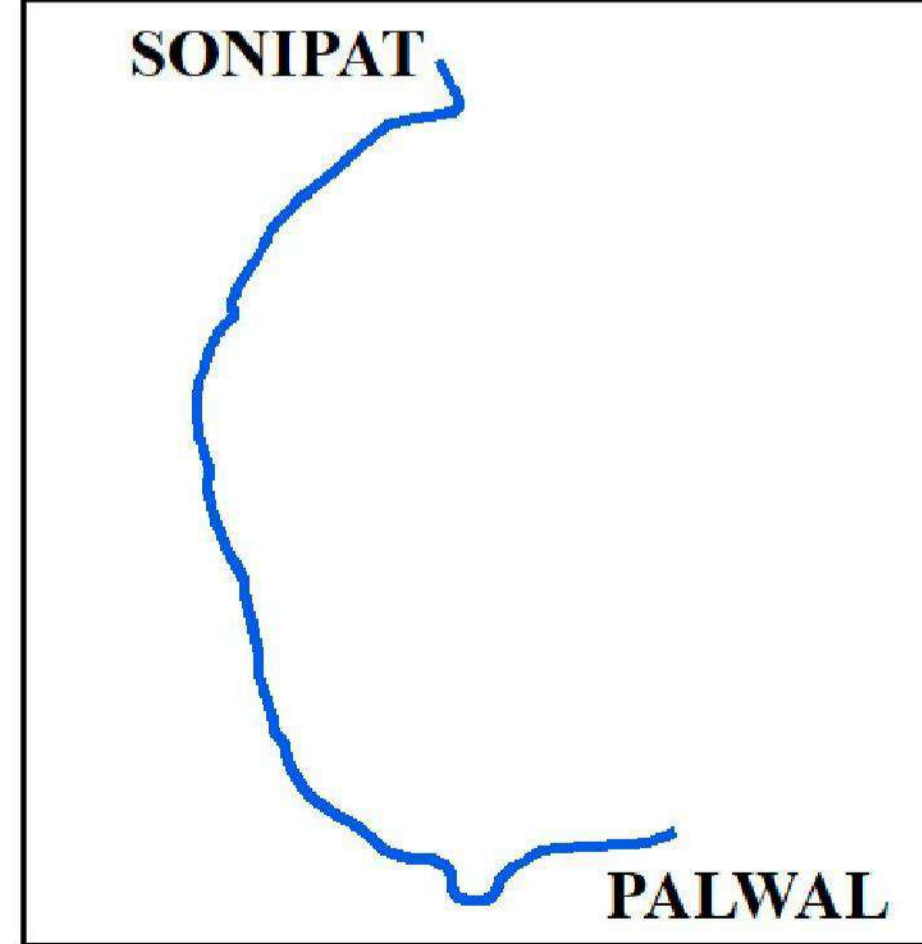
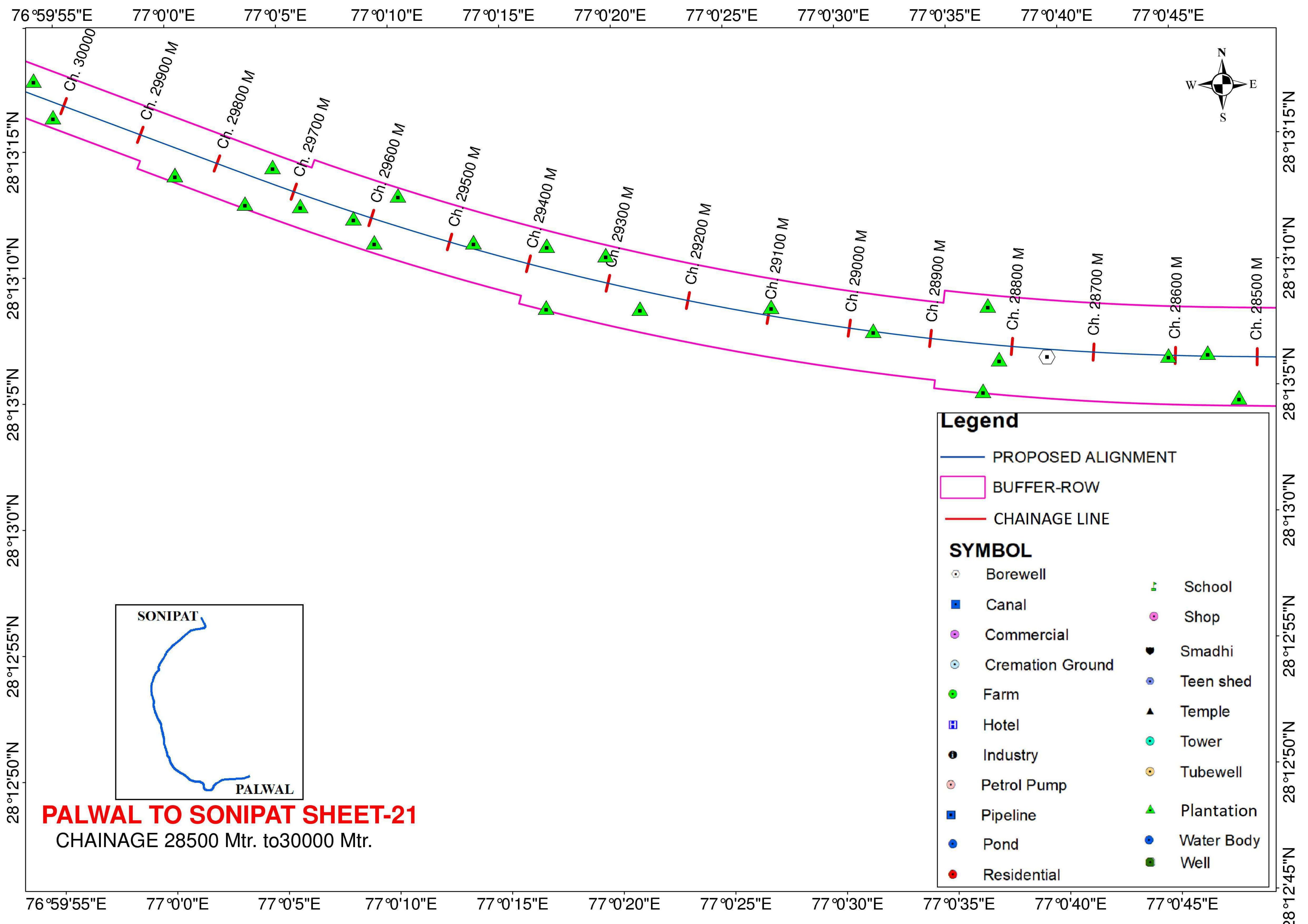
- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

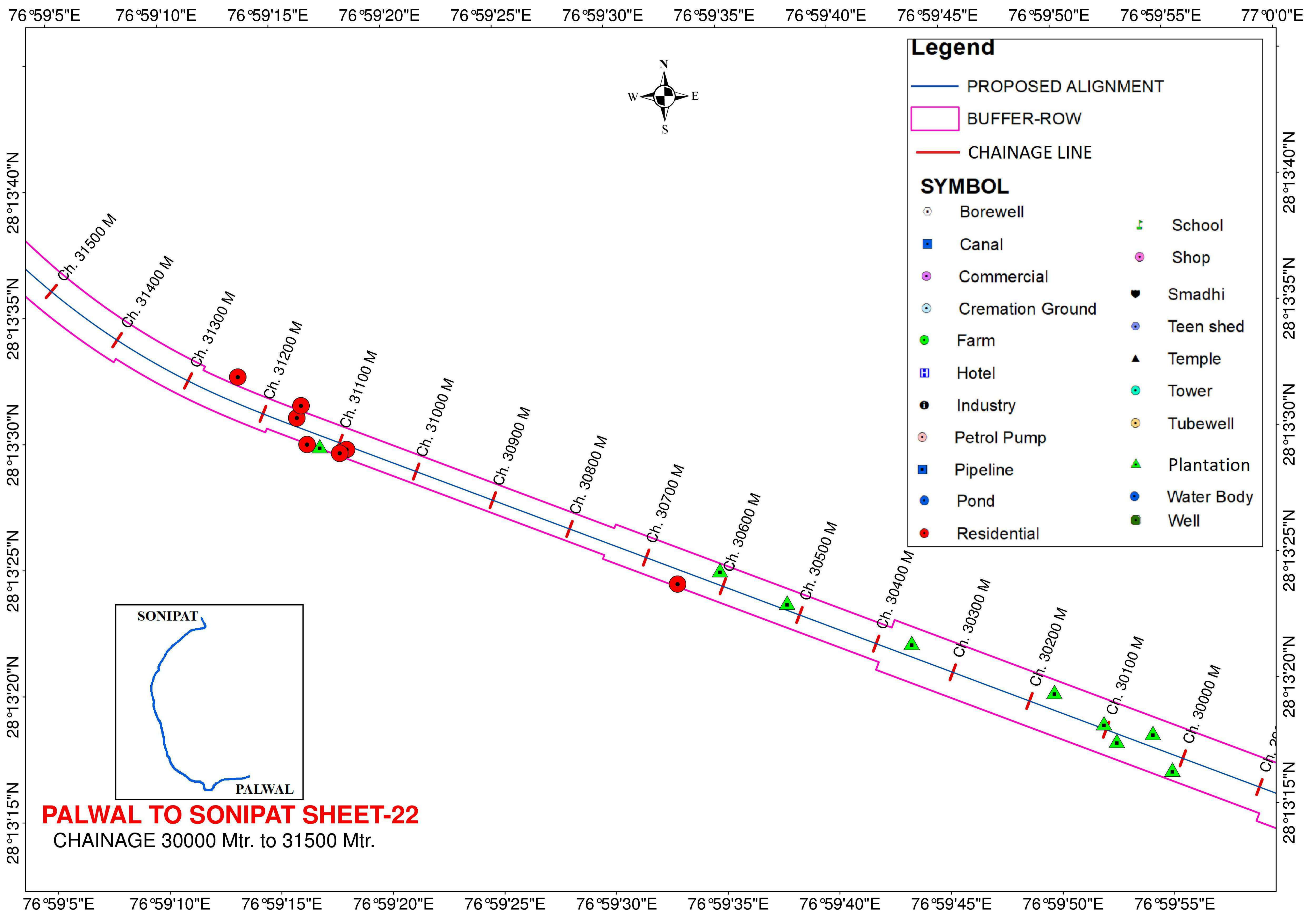
SYMBOL

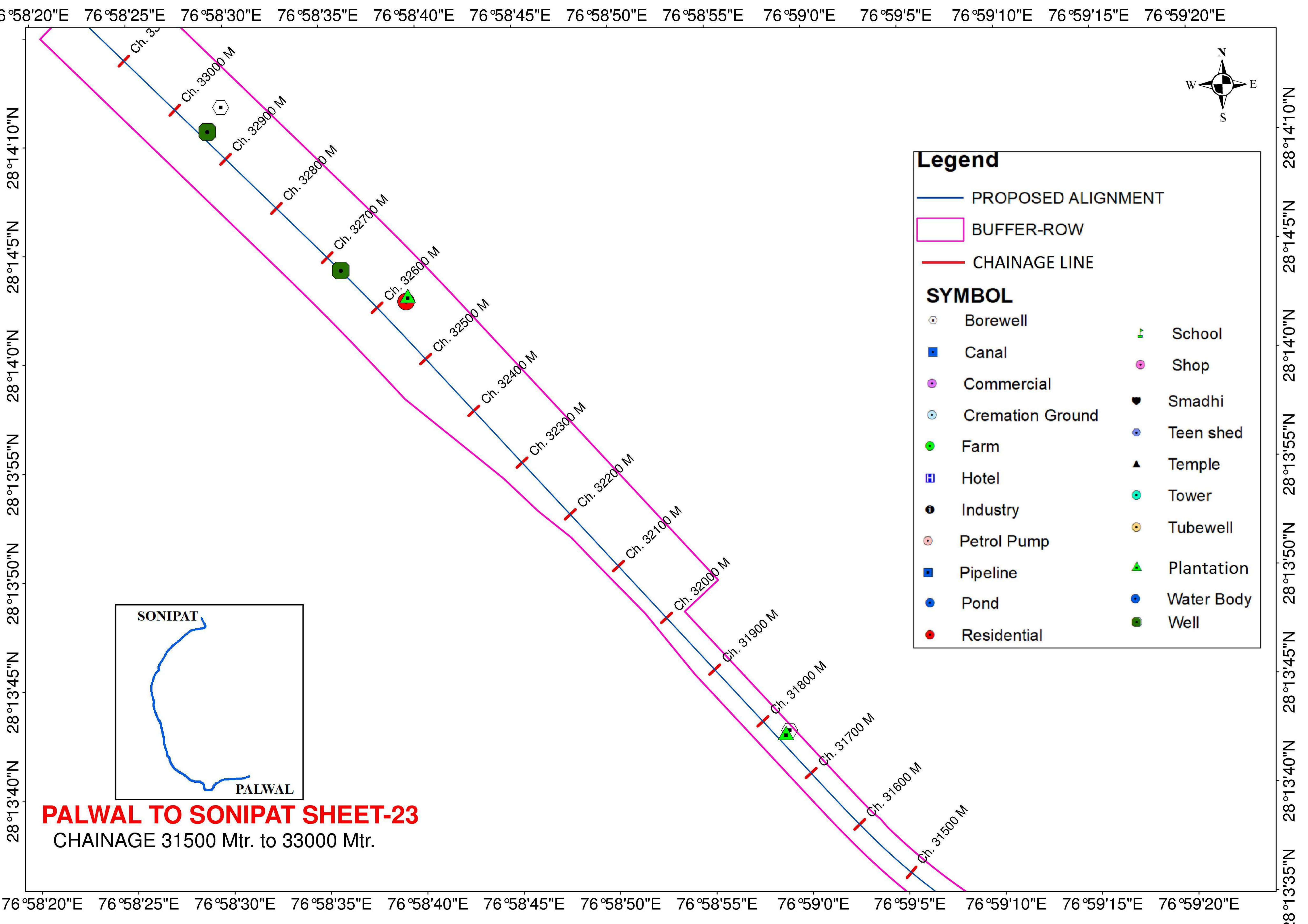
Borewell	School
Canal	Shop
Commercial	Smadhi
Cremation Ground	Teen shed
Farm	Temple
Hotel	Tower
Industry	Tubewell
Petrol Pump	Plantation
Pipeline	Water Body
Pond	Well
Residential	

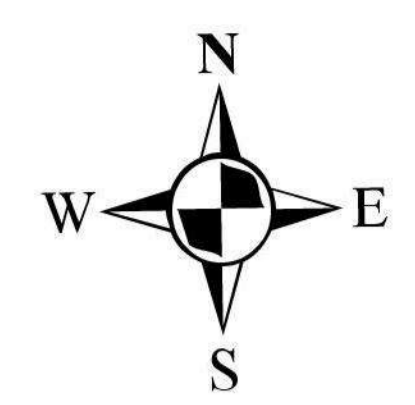
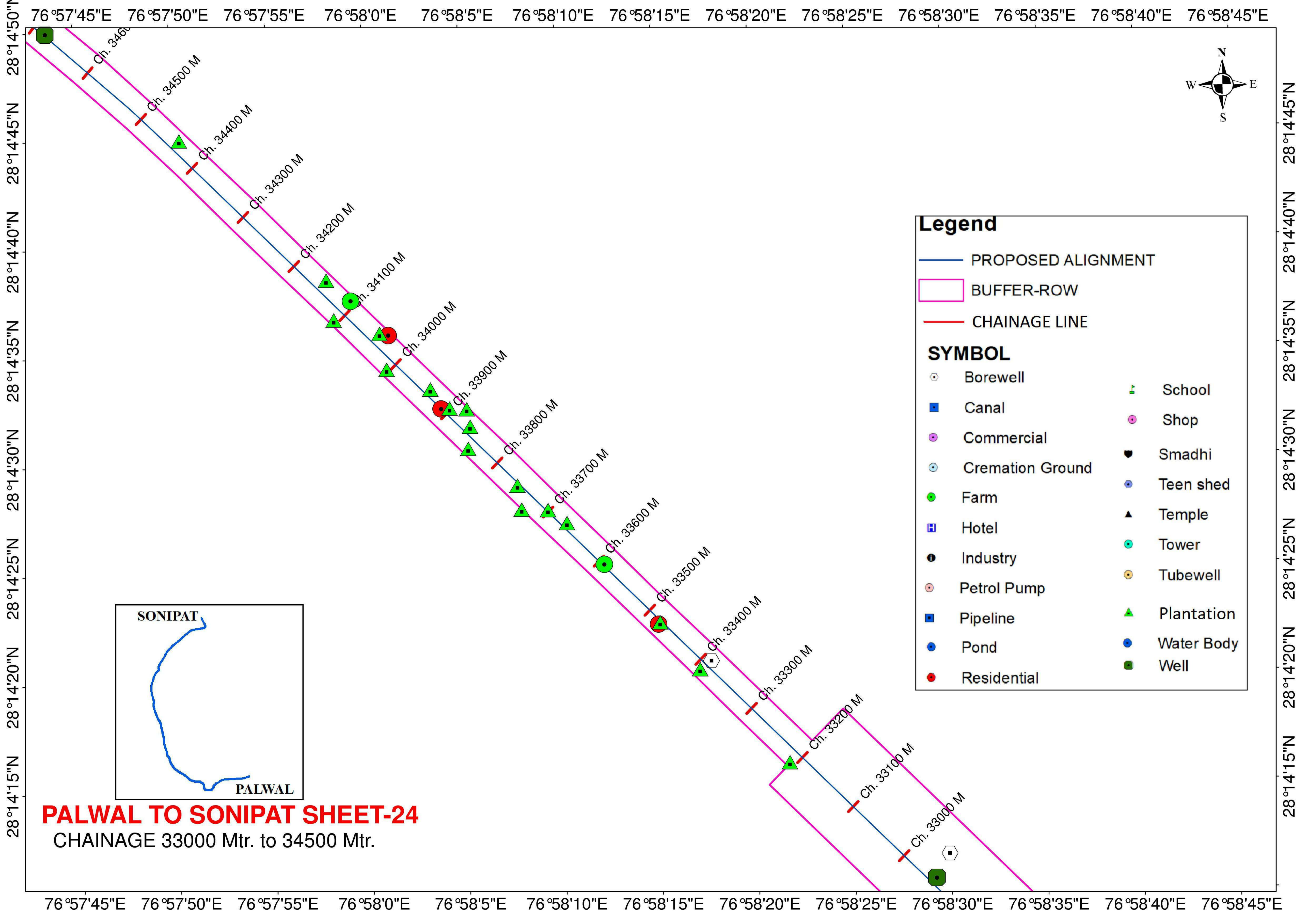


PALWAL TO SONIPAT SHEET-20
 CHAINAGE 27000 Mtr. to 28500 Mtr.







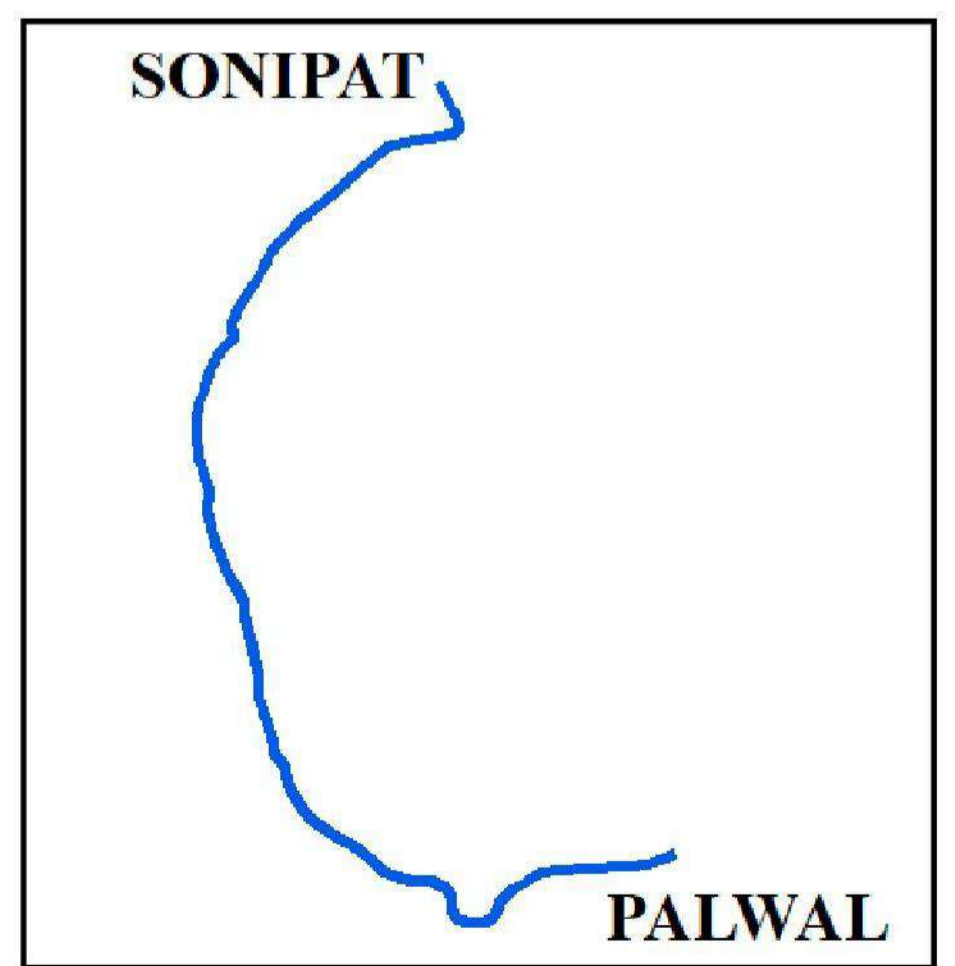


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

○ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
○ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



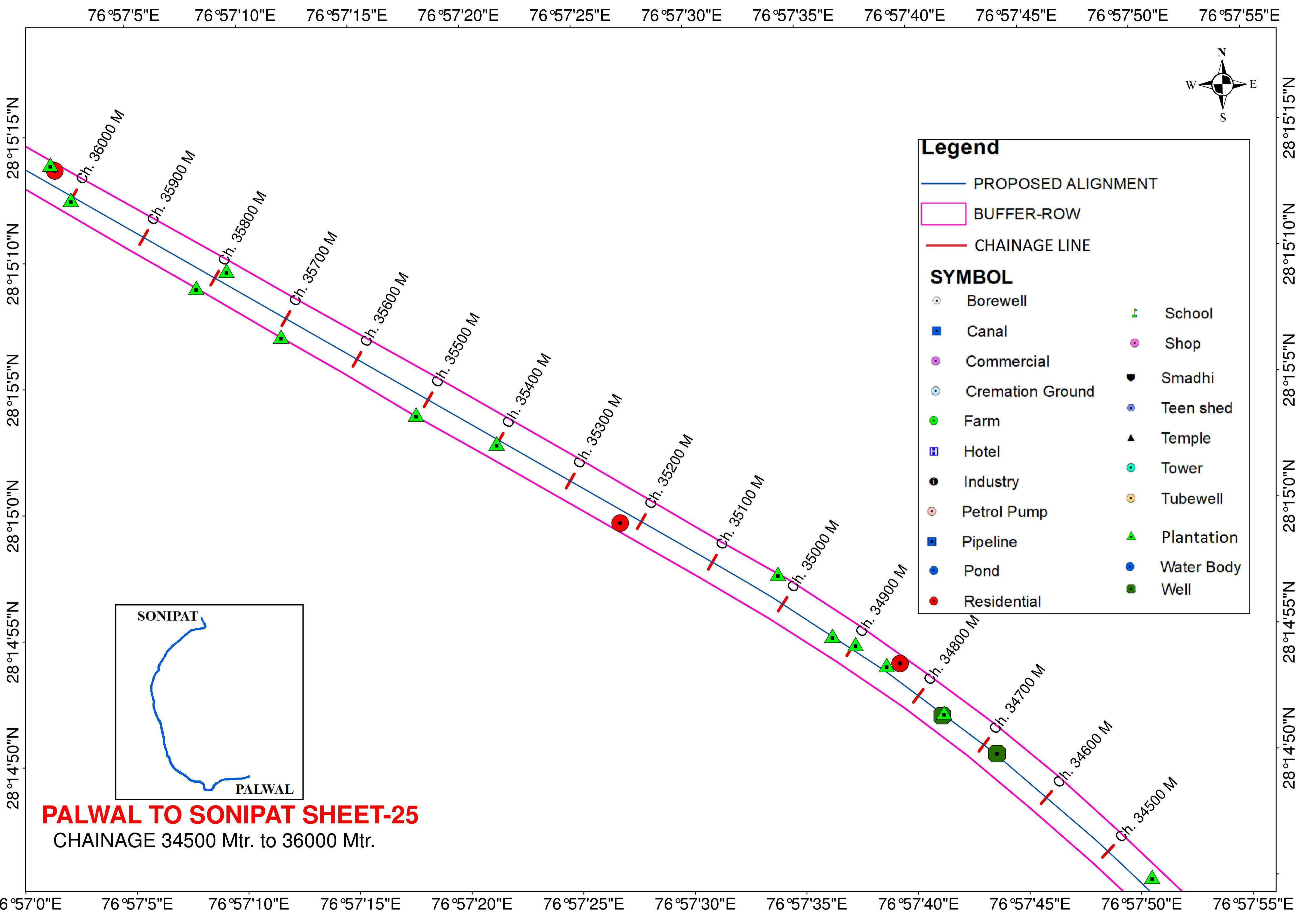
PALWAL TO SONIPAT SHEET-24
 CHAINAGE 33000 Mtr. to 34500 Mtr.

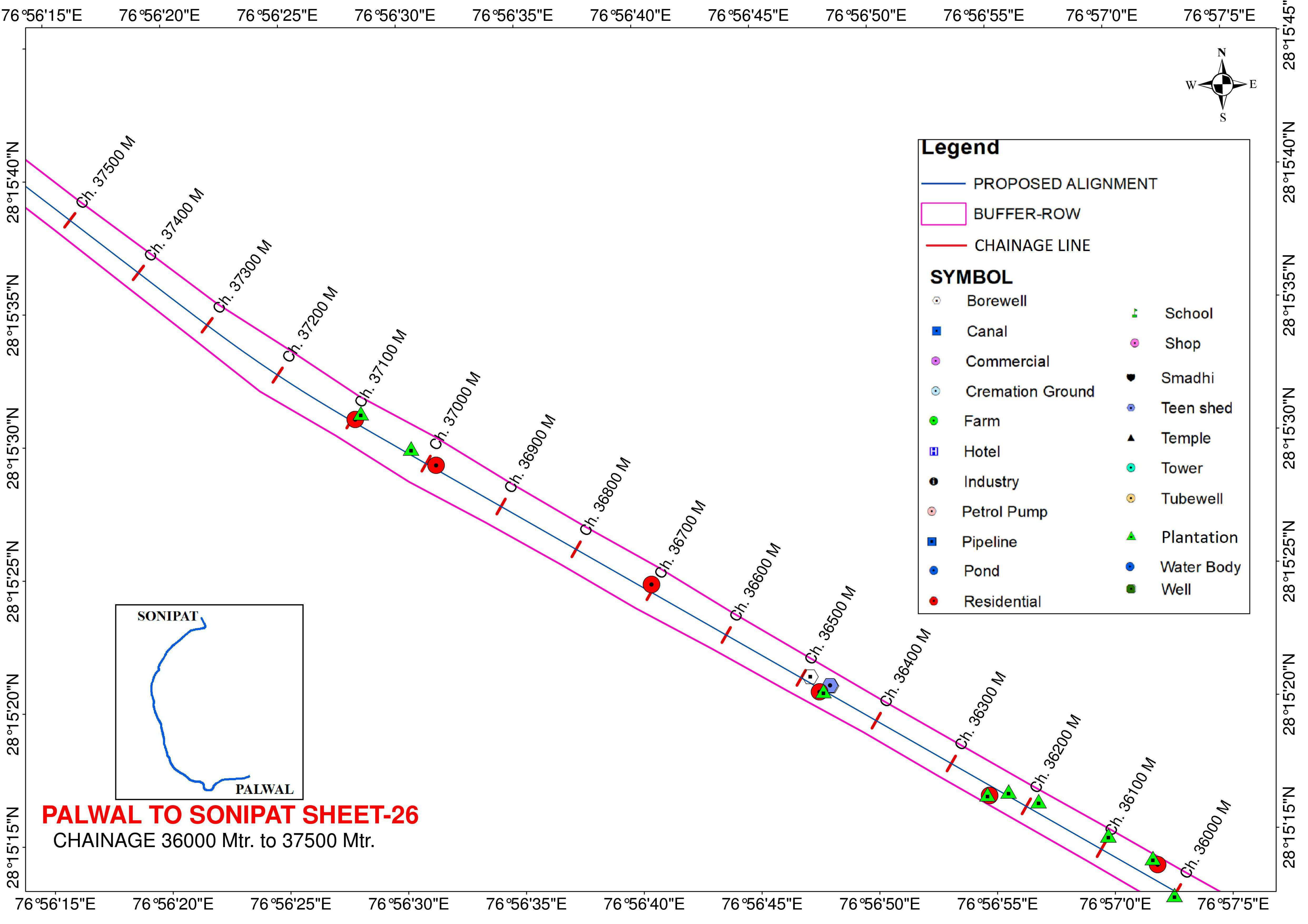
76°57'45"E 76°57'50"E 76°57'55"E 76°58'0"E 76°58'5"E 76°58'10"E 76°58'15"E 76°58'20"E 76°58'25"E 76°58'30"E 76°58'35"E 76°58'40"E 76°58'45"E

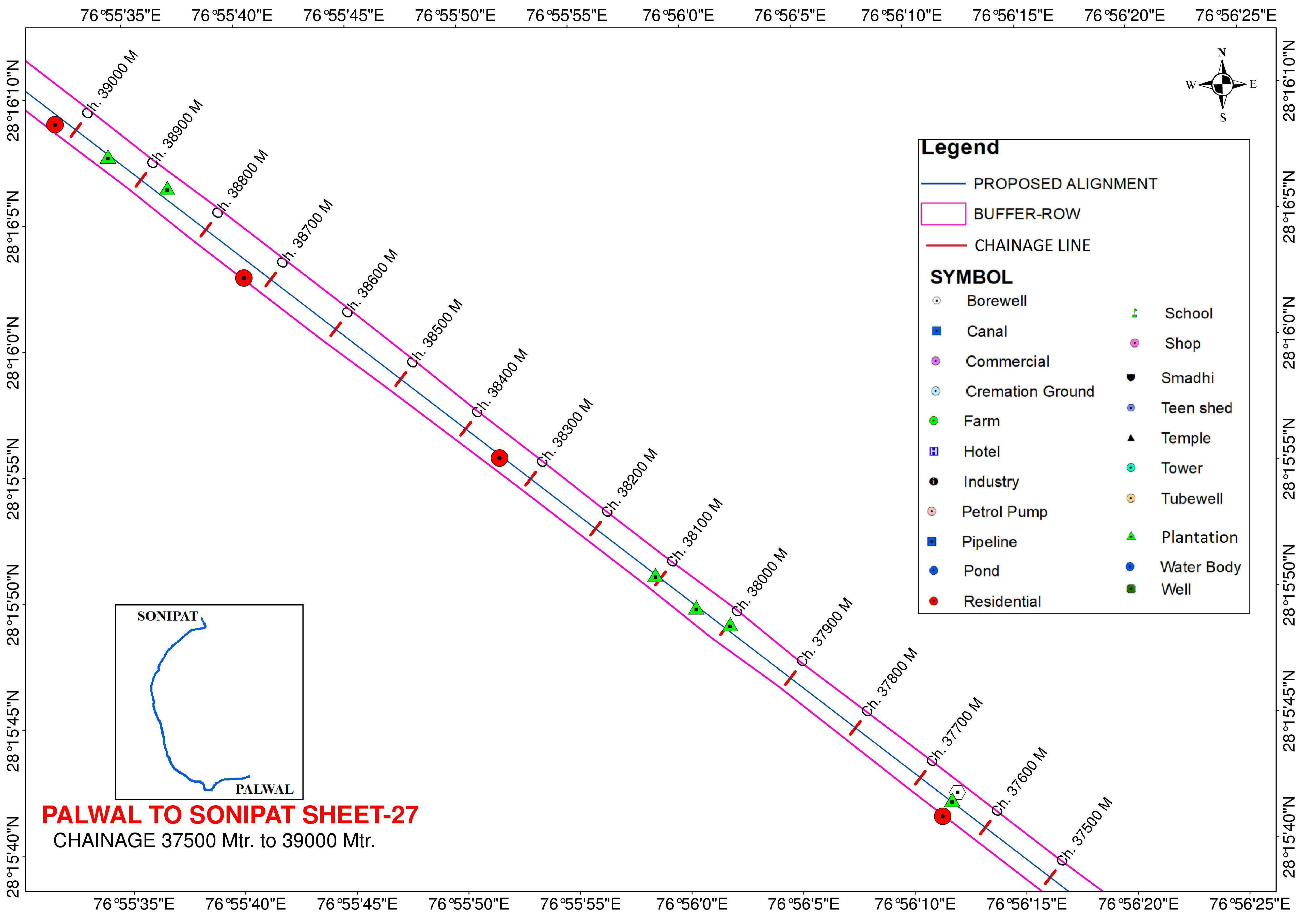
76°57'45"E 76°57'50"E 76°57'55"E 76°58'0"E 76°58'5"E 76°58'10"E 76°58'15"E 76°58'20"E 76°58'25"E 76°58'30"E 76°58'35"E 76°58'40"E 76°58'45"E

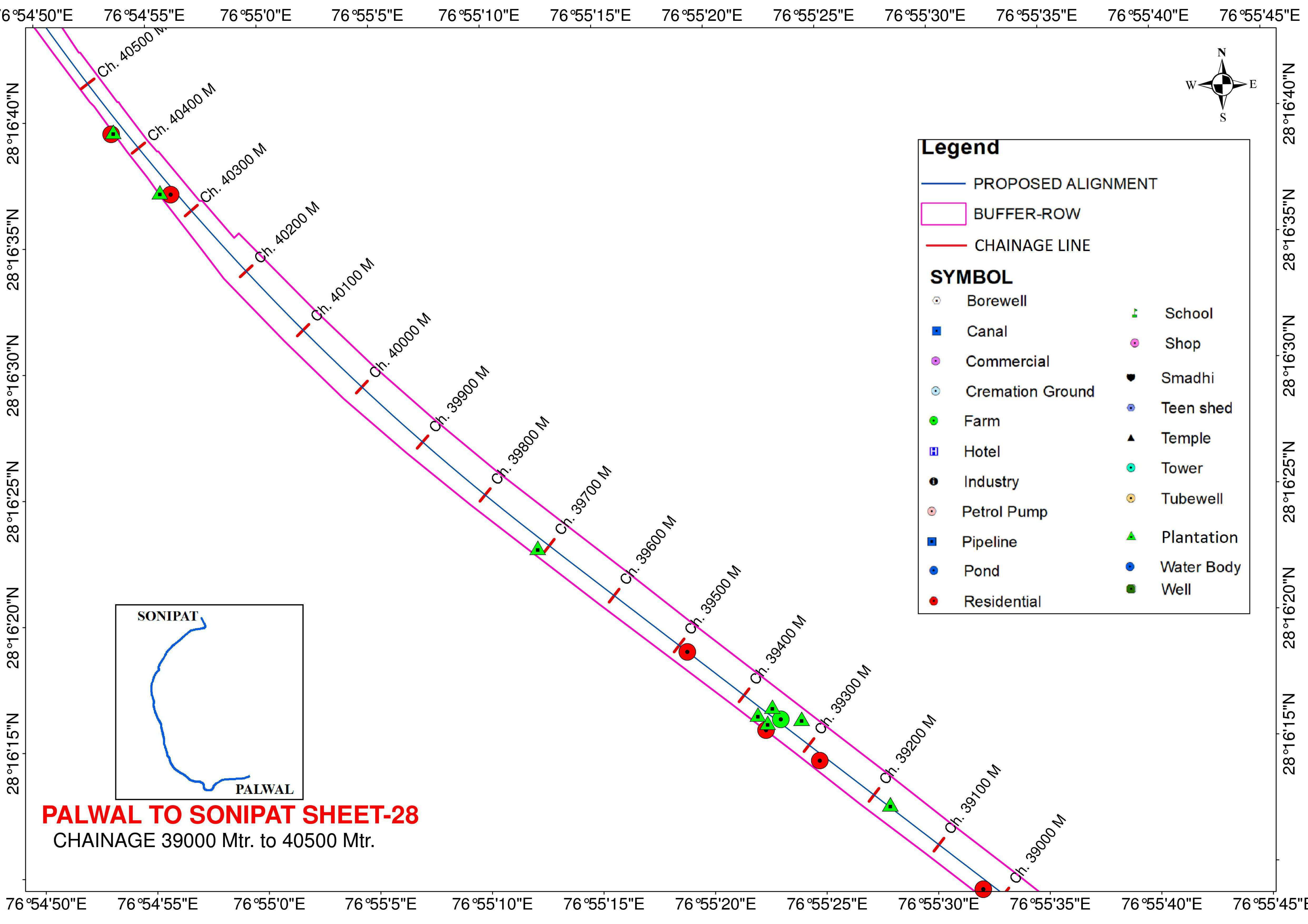
28°14'15"N
28°14'20"N
28°14'25"N
28°14'30"N
28°14'35"N
28°14'40"N
28°14'45"N

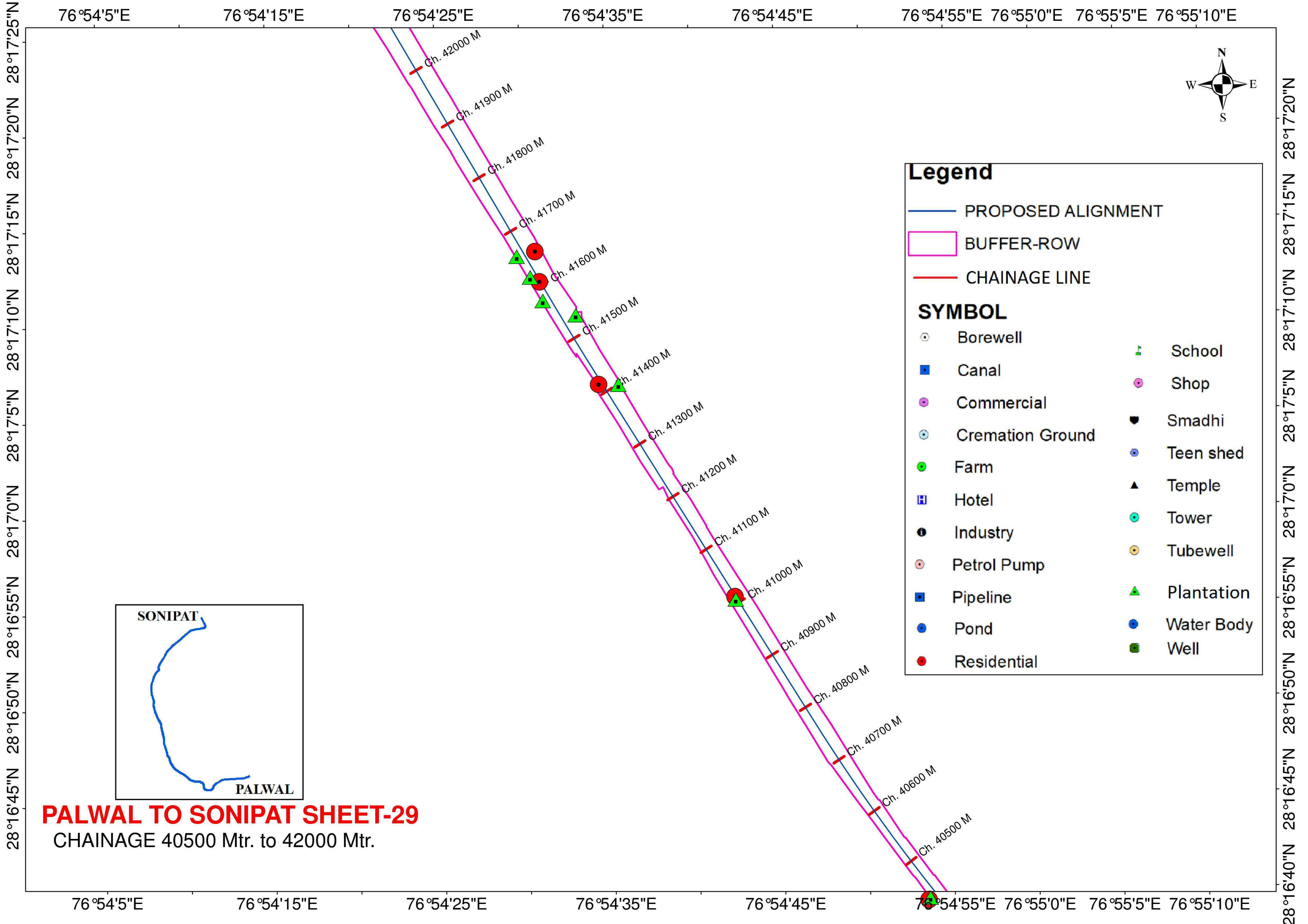
28°14'15"N
28°14'20"N
28°14'25"N
28°14'30"N
28°14'35"N
28°14'40"N
28°14'45"N











76°54'5"E

76°54'15"E

76°54'25"E

76°54'35"E

76°54'45"E

76°54'55"E

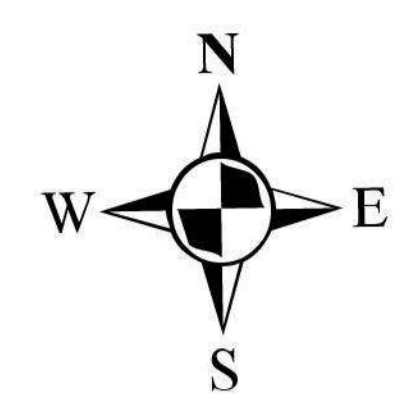
76°55'0"E

76°55'5"E

76°55'10"E

28°16'40"N
28°16'45"N
28°16'50"N
28°16'55"N
28°17'0"N
28°17'5"N
28°17'10"N
28°17'15"N
28°17'20"N
28°17'25"N

28°16'40"N
28°16'45"N
28°16'50"N
28°16'55"N
28°17'0"N
28°17'5"N
28°17'10"N
28°17'15"N
28°17'20"N
28°17'25"N

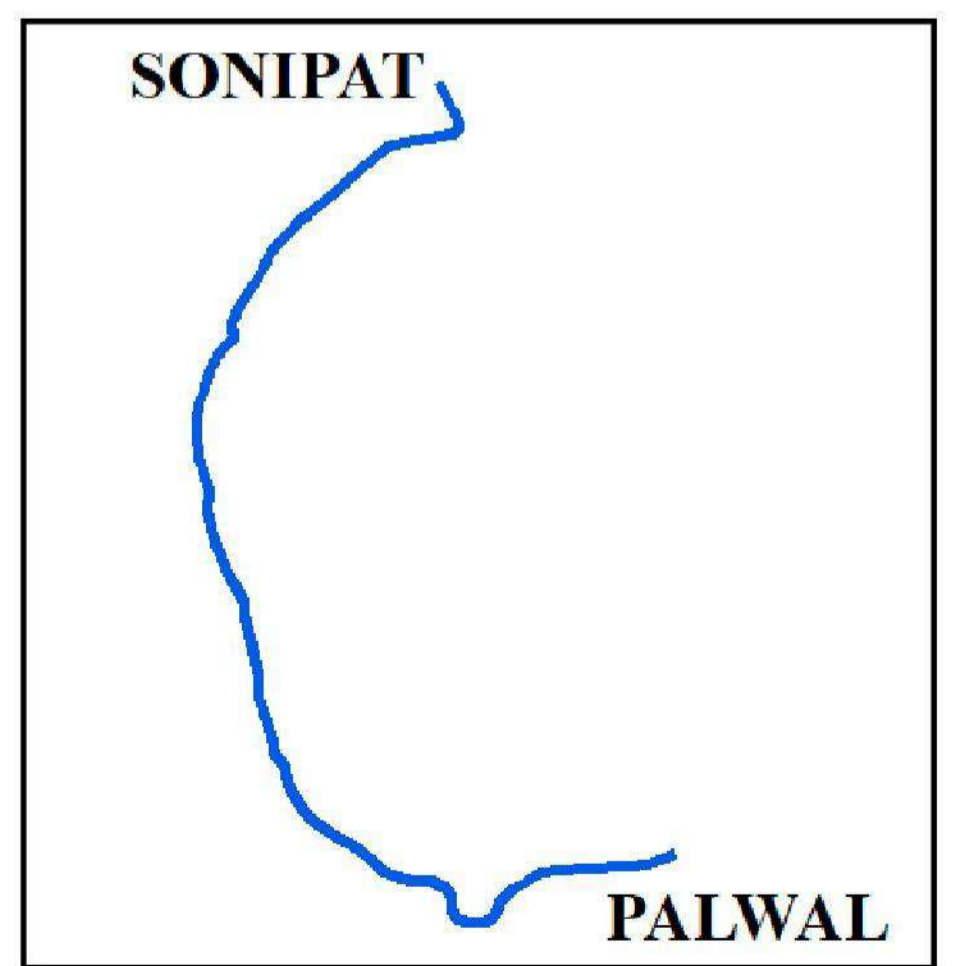


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
H Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-29
CHAINAGE 40500 Mtr. to 42000 Mtr.

76°54'5"E

76°54'15"E

76°54'25"E

76°54'35"E

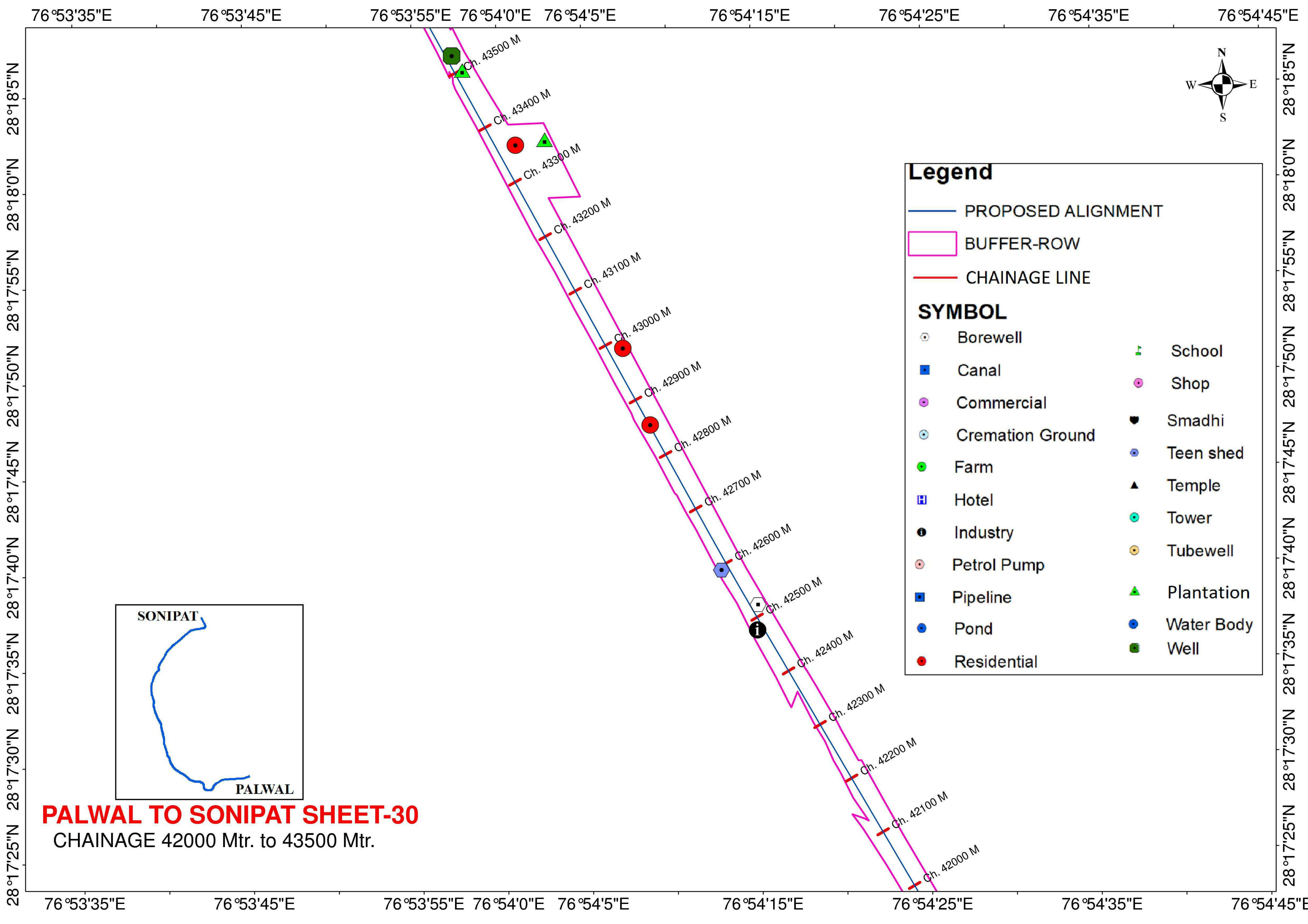
76°54'45"E

76°54'55"E

76°55'0"E

76°55'5"E

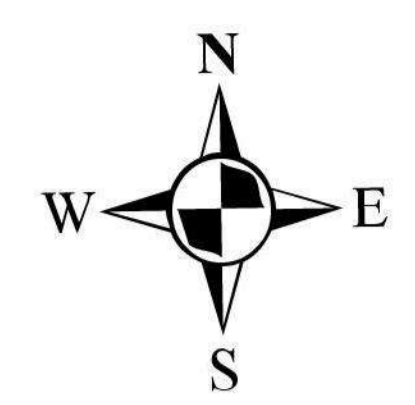
76°55'10"E



76°53'35"E 76°53'45"E 76°53'55"E 76°54'0"E 76°54'5"E 76°54'15"E 76°54'25"E 76°54'35"E 76°54'45"E

28°17'25"N 28°17'30"N 28°17'35"N 28°17'40"N 28°17'45"N 28°17'50"N 28°17'55"N 28°18'0"N 28°18'5"N

28°17'25"N 28°17'30"N 28°17'35"N 28°17'40"N 28°17'45"N 28°17'50"N 28°17'55"N 28°18'0"N 28°18'5"N

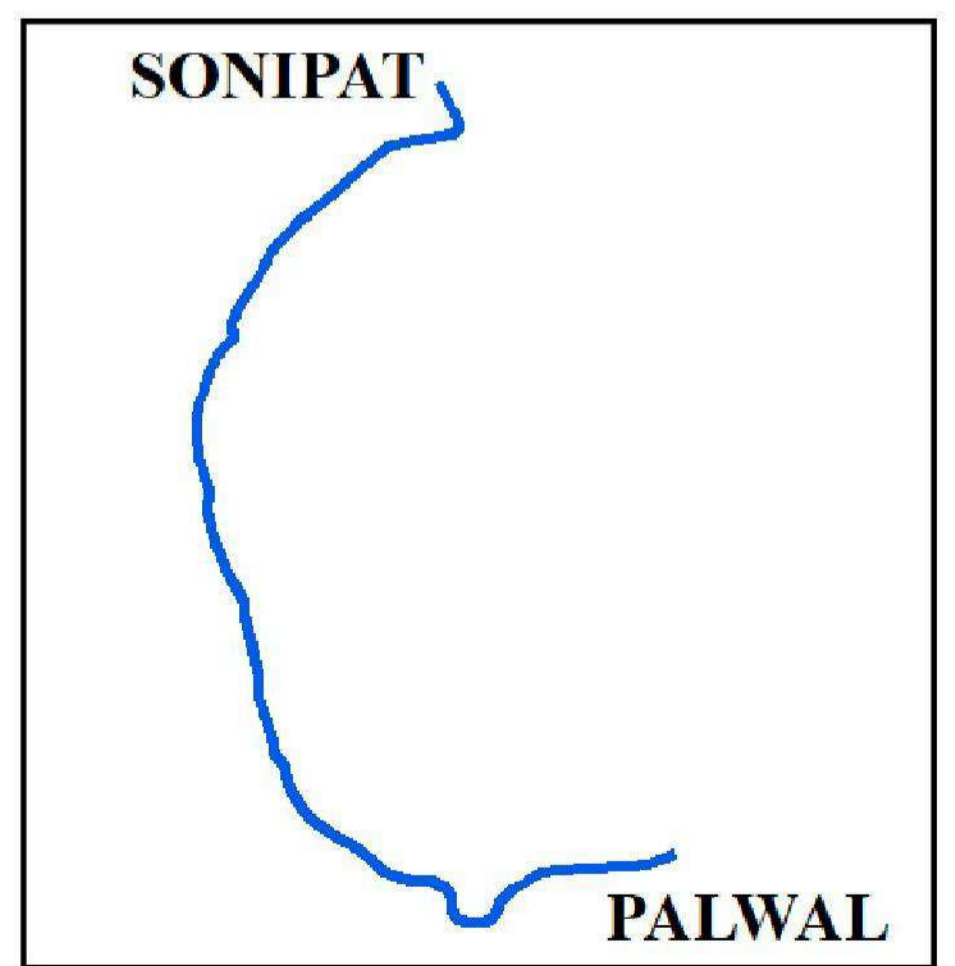


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

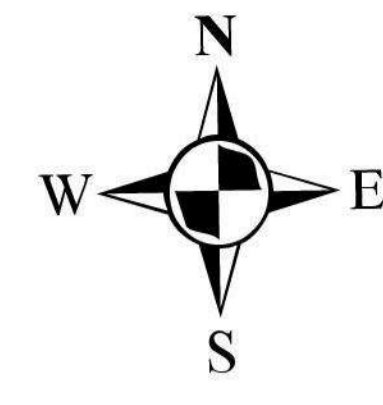
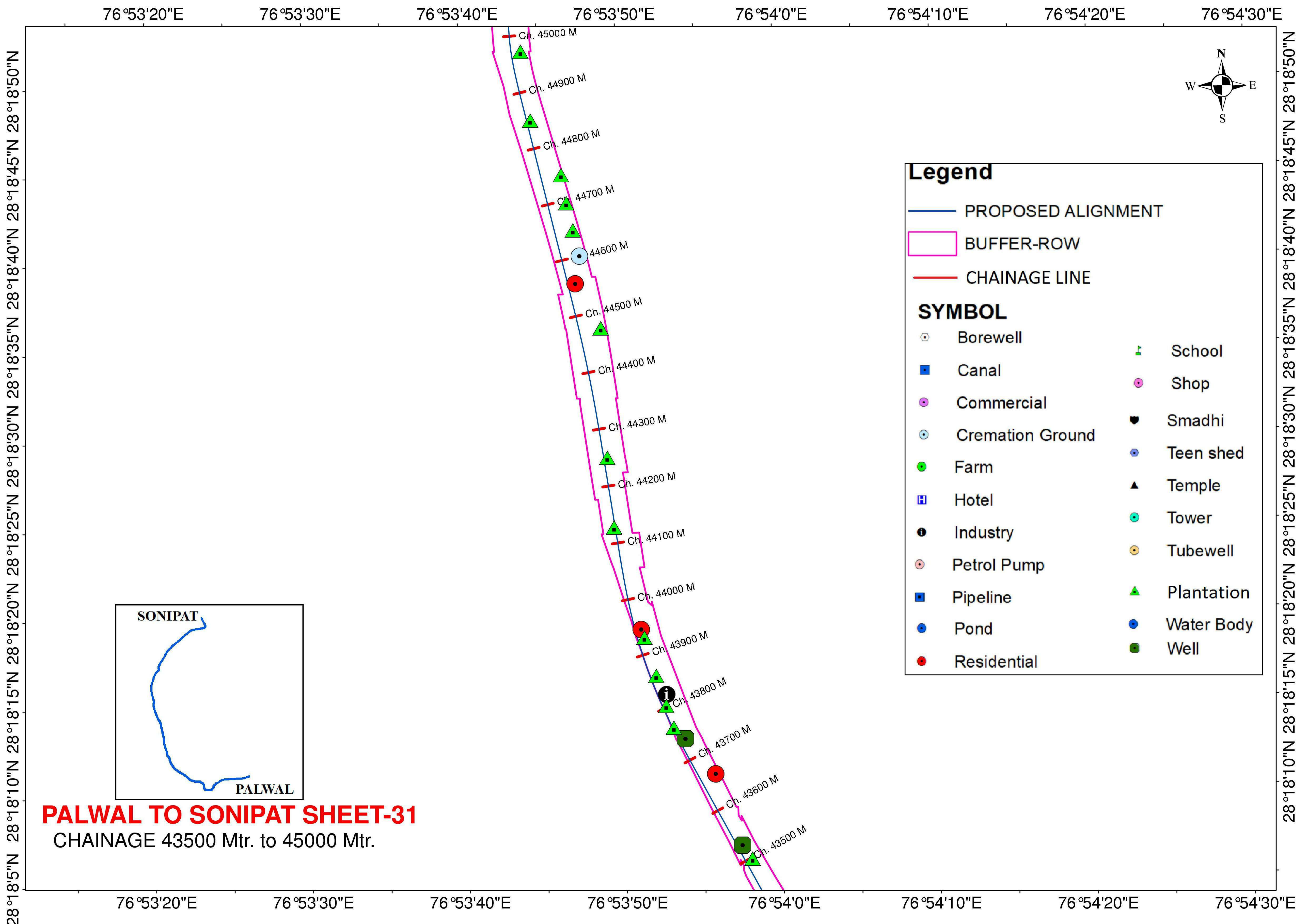
SYMBOL

	Borewell		School
	Canal		Shop
	Commercial		Smadhi
	Cremation Ground		Teen shed
	Farm		Temple
	Hotel		Tower
	Industry		Tubewell
	Petrol Pump		Plantation
	Pipeline		Water Body
	Pond		Well
	Residential		



PALWAL TO SONIPAT SHEET-30
CHAINAGE 42000 Mtr. to 43500 Mtr.

76°53'35"E 76°53'45"E 76°53'55"E 76°54'0"E 76°54'5"E 76°54'15"E 76°54'25"E 76°54'35"E 76°54'45"E

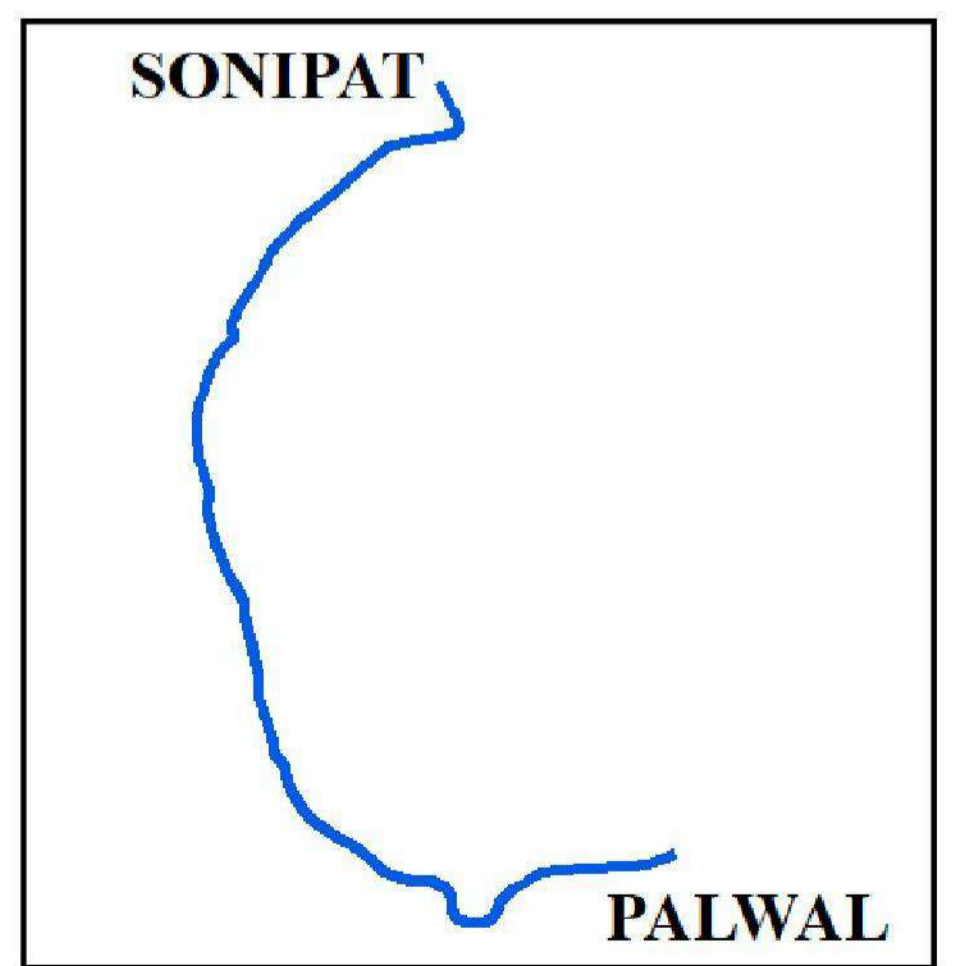


Legend

— PROPOSED ALIGNMENT
 □ BUFFER-ROW
 - - CHAINAGE LINE

SYMBOL

○ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

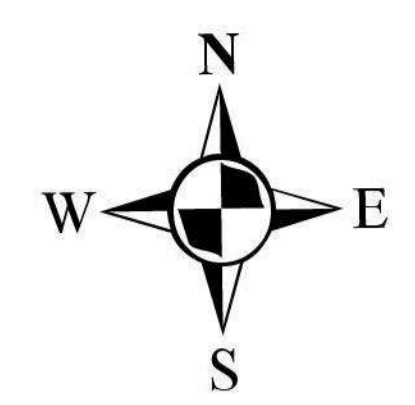
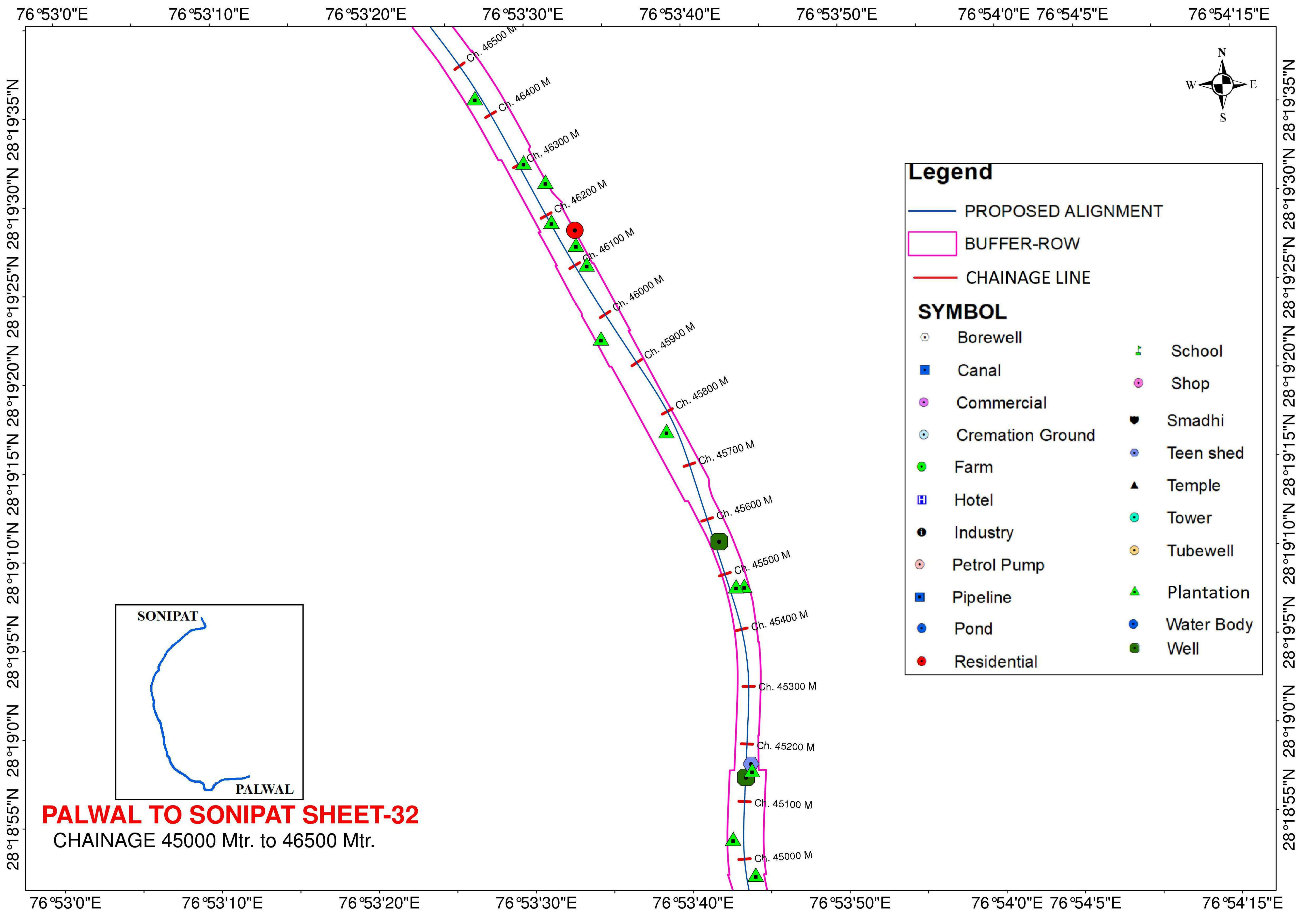


PALWAL TO SONIPAT SHEET-31
 CHAINAGE 43500 Mtr. to 45000 Mtr.

76°53'20"E 76°53'30"E 76°53'40"E 76°53'50"E 76°54'0"E 76°54'10"E 76°54'20"E 76°54'30"E

28°18'10"N 28°18'15"N 28°18'20"N 28°18'25"N 28°18'30"N 28°18'35"N 28°18'40"N 28°18'45"N 28°18'50"N

28°18'10"N 28°18'15"N 28°18'20"N 28°18'25"N 28°18'30"N 28°18'35"N 28°18'40"N 28°18'45"N 28°18'50"N

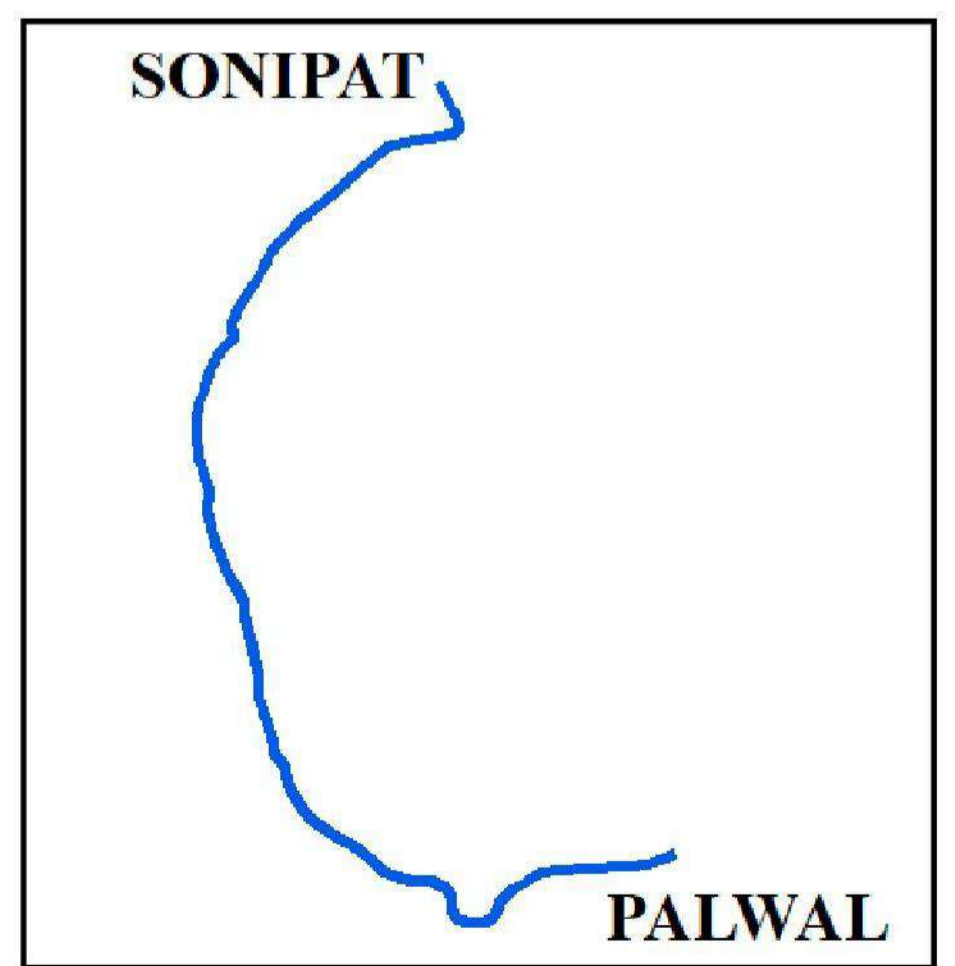


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

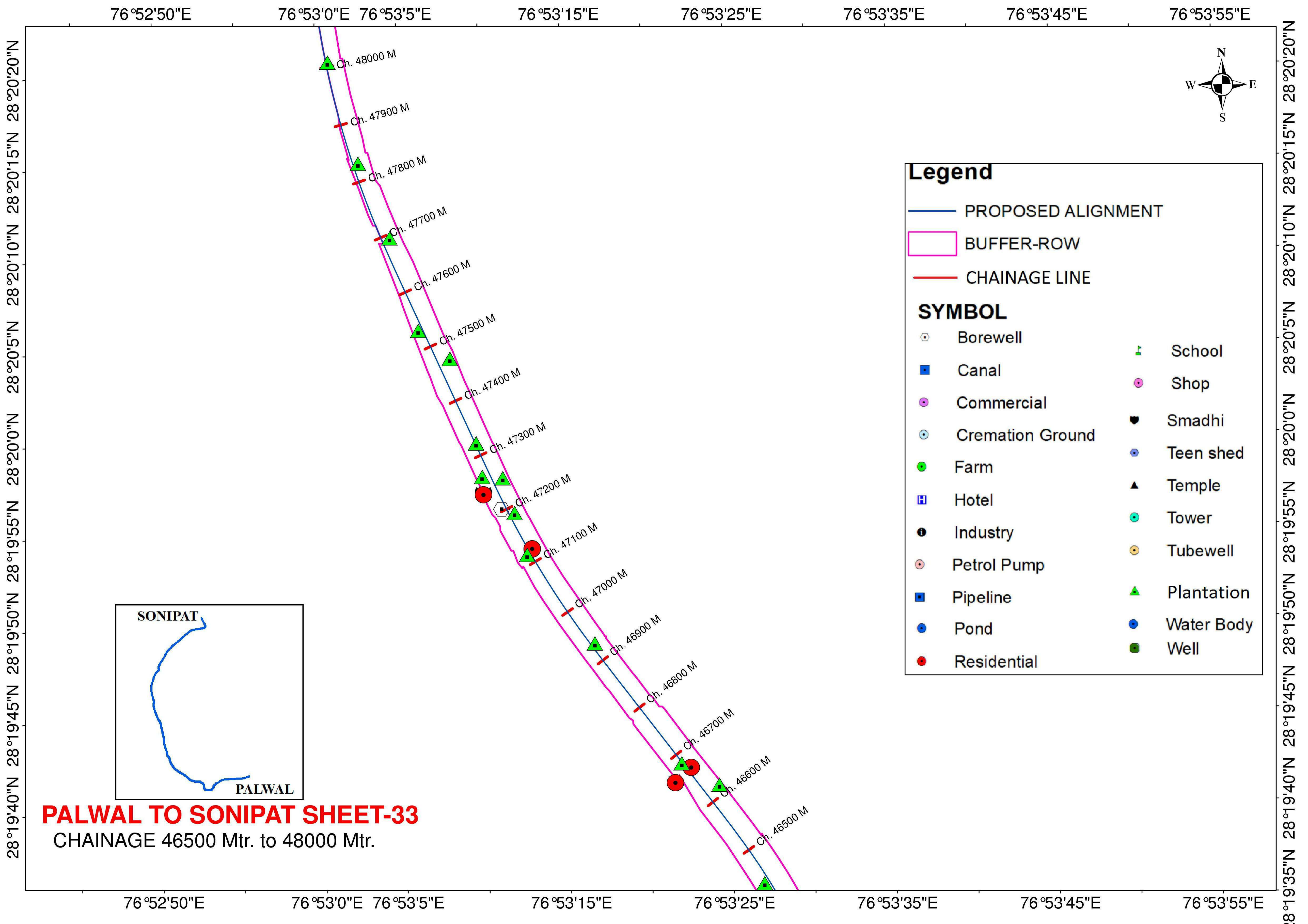
SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	⬢ Teen shed
● Farm	▲ Temple
H Hotel	⊙ Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

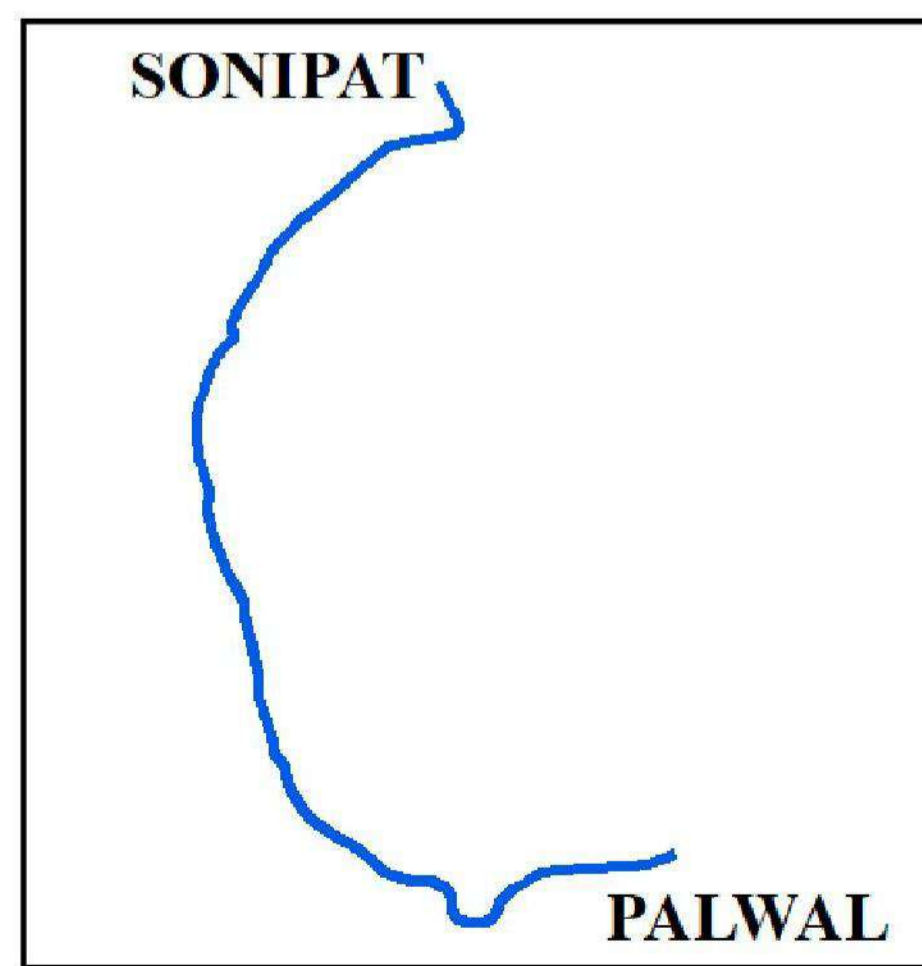
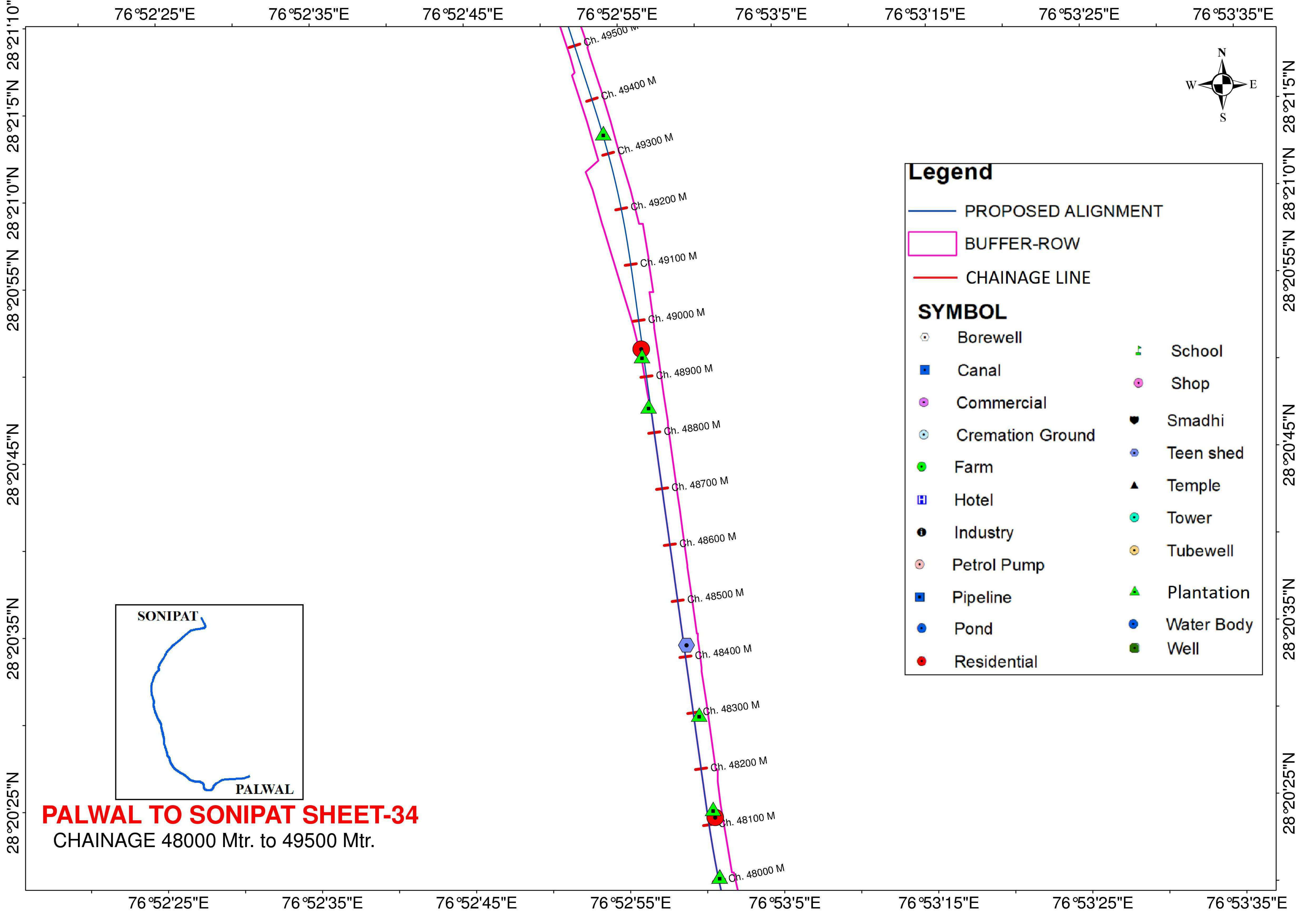


PALWAL TO SONIPAT SHEET-32
CHAINAGE 45000 Mtr. to 46500 Mtr.

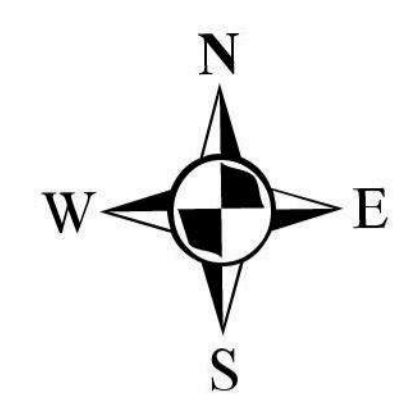
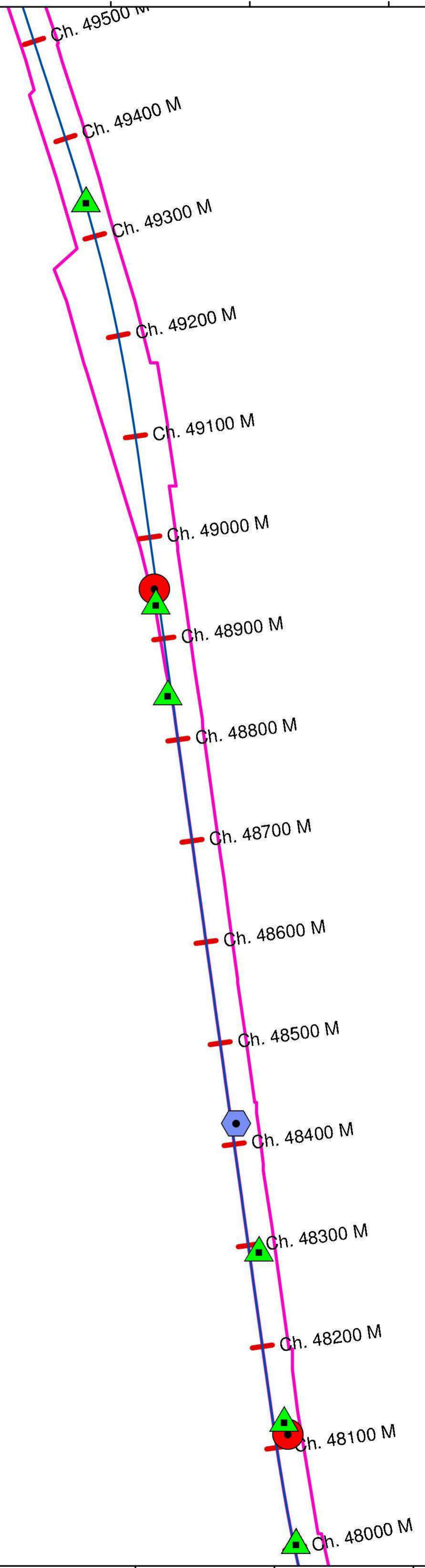
Ch. 46500 M
Ch. 46400 M
Ch. 46300 M
Ch. 46200 M
Ch. 46100 M
Ch. 46000 M
Ch. 45900 M
Ch. 45800 M
Ch. 45700 M
Ch. 45600 M
Ch. 45500 M
Ch. 45400 M
Ch. 45300 M
Ch. 45200 M
Ch. 45100 M
Ch. 45000 M

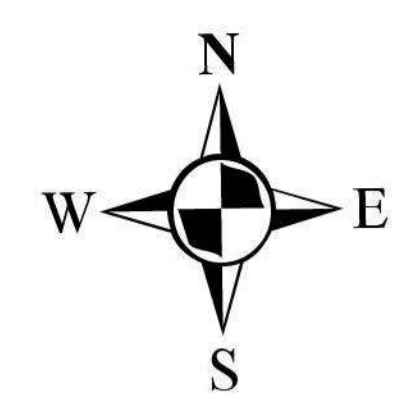
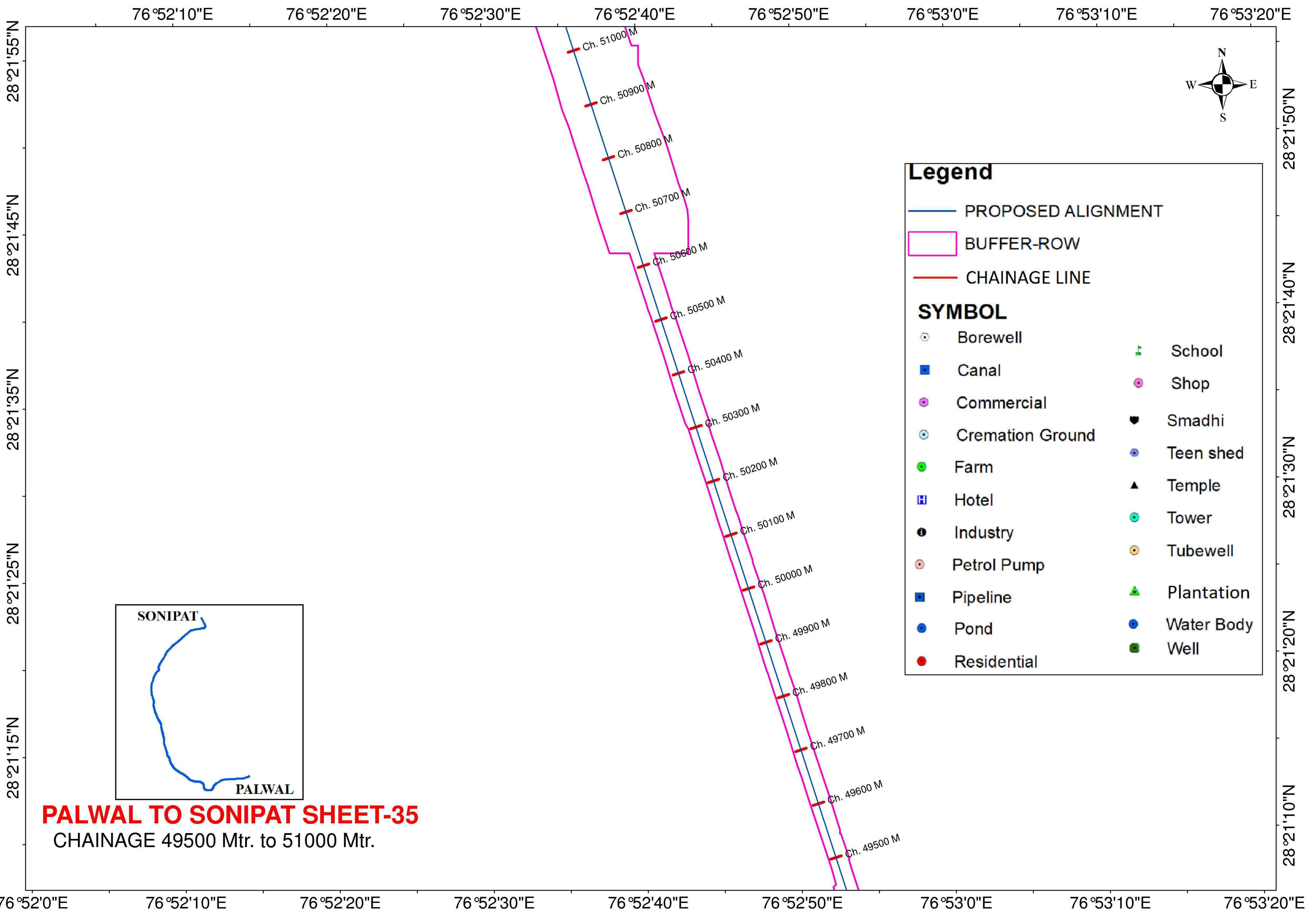


PALWAL TO SONIPAT SHEET-33
CHAINAGE 46500 Mtr. to 48000 Mtr.



PALWAL TO SONIPAT SHEET-34
CHAINAGE 48000 Mtr. to 49500 Mtr.



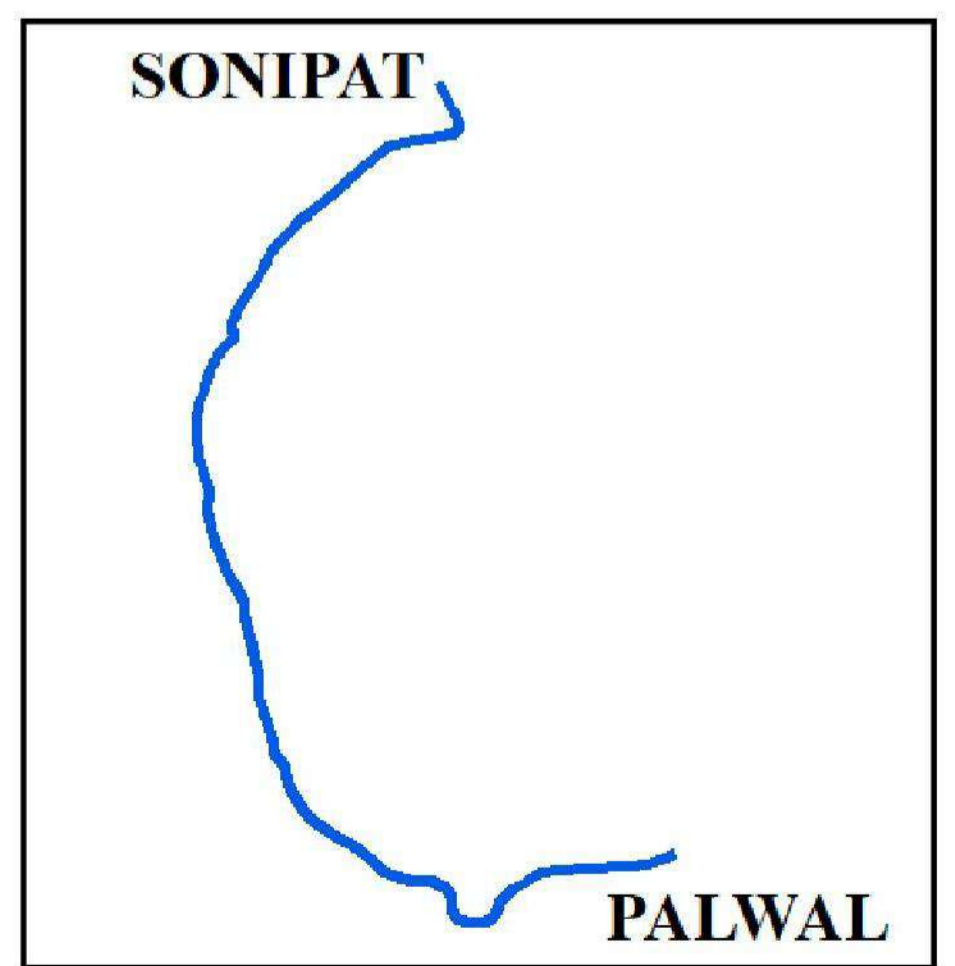


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

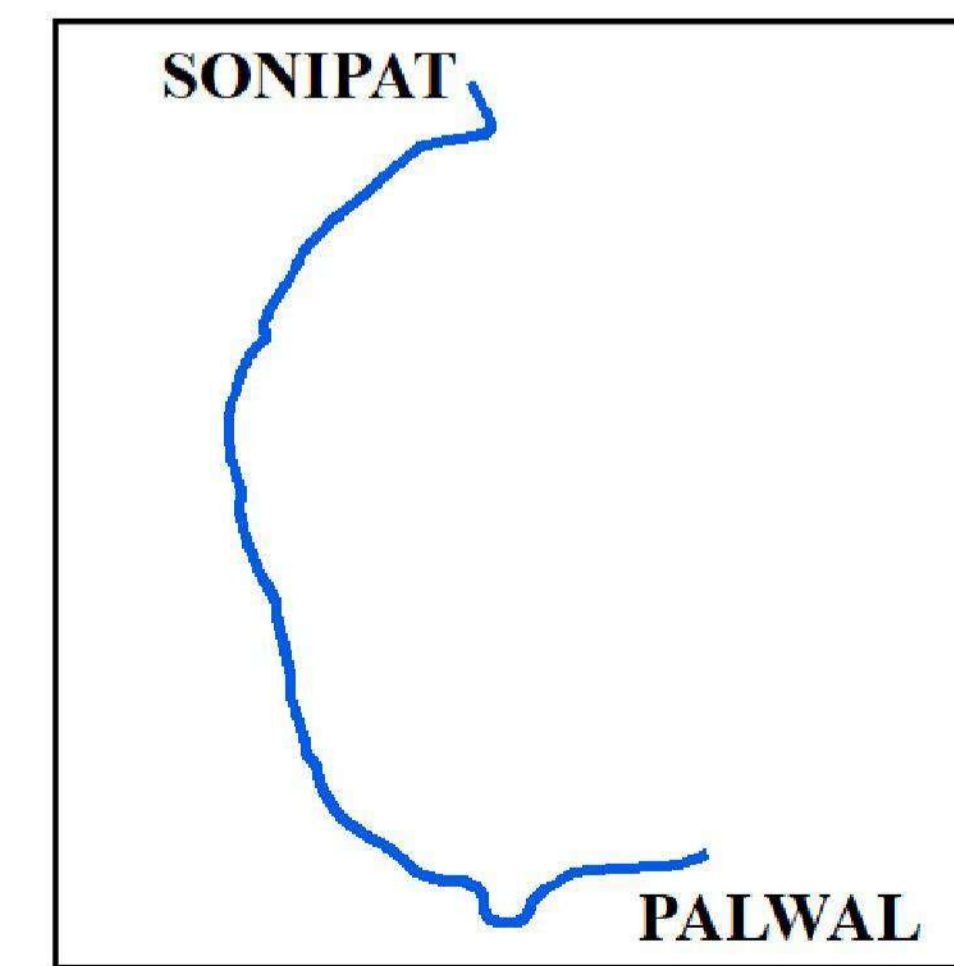
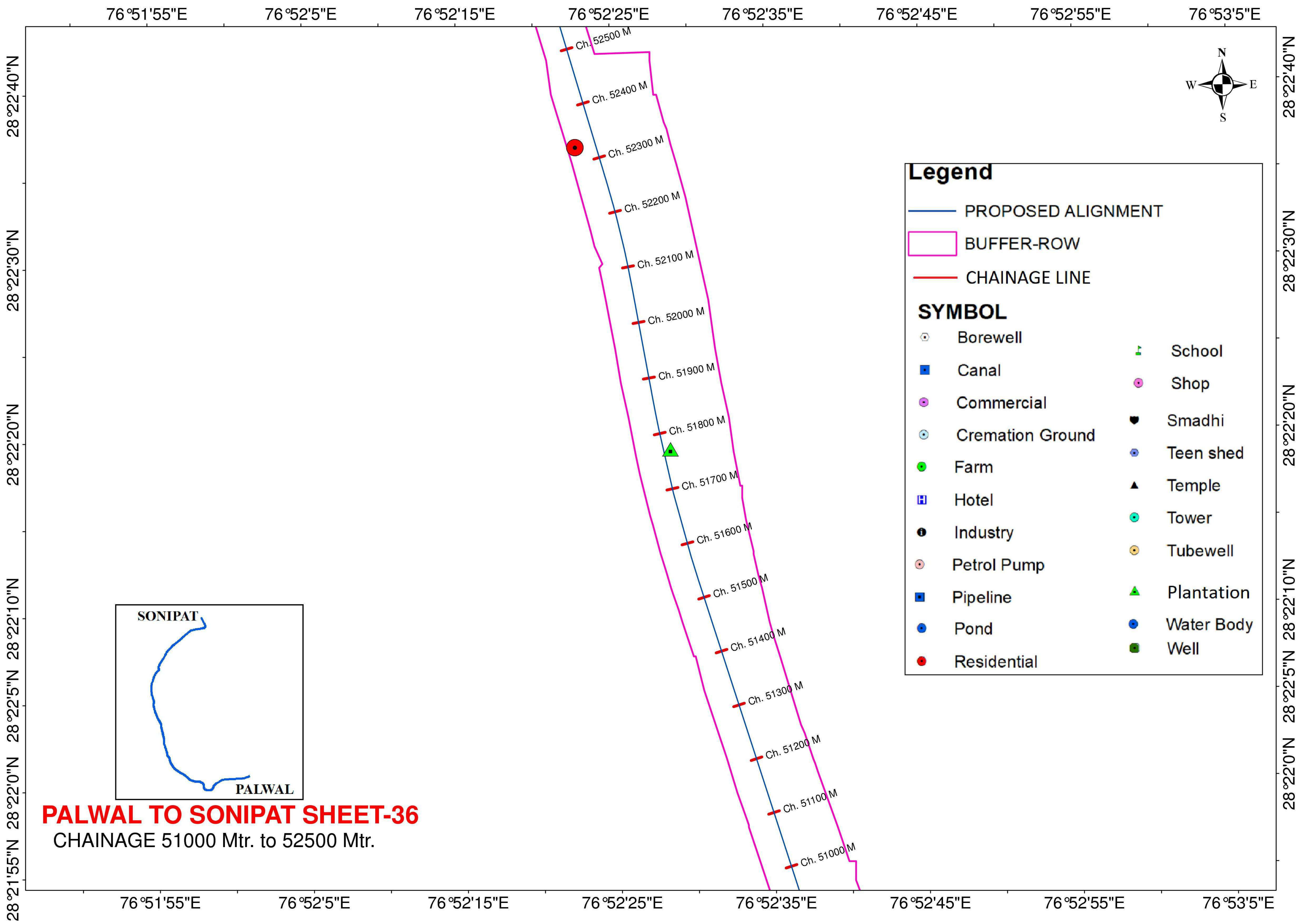
SYMBOL

○ Borewell	▲ School
 Canal	○ Shop
○ Commercial	 Smadhi
○ Cremation Ground	○ Teen shed
 Farm	 Temple
 Hotel	○ Tower
 Industry	○ Tubewell
○ Petrol Pump	 Plantation
 Pipeline	○ Water Body
○ Pond	 Well
○ Residential	

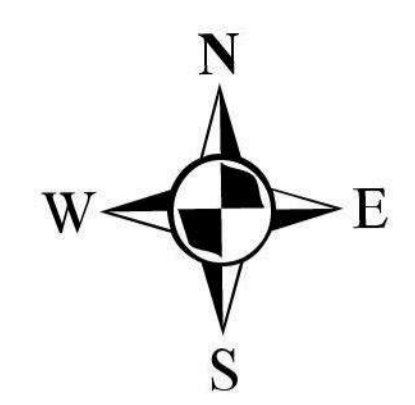
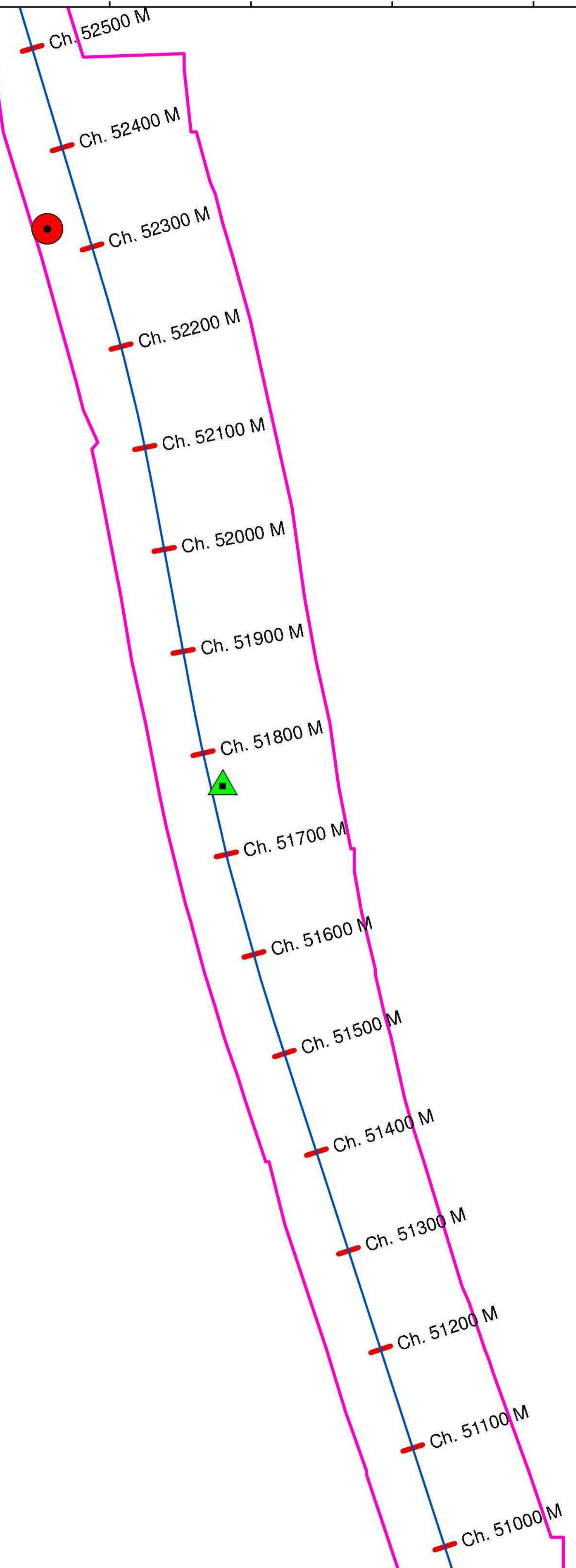


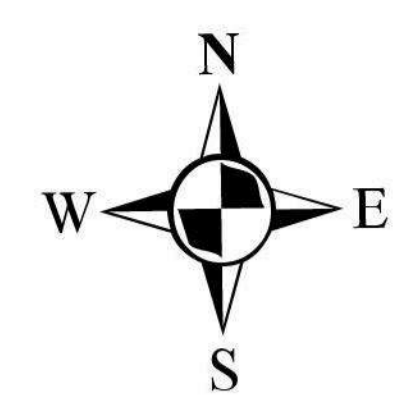
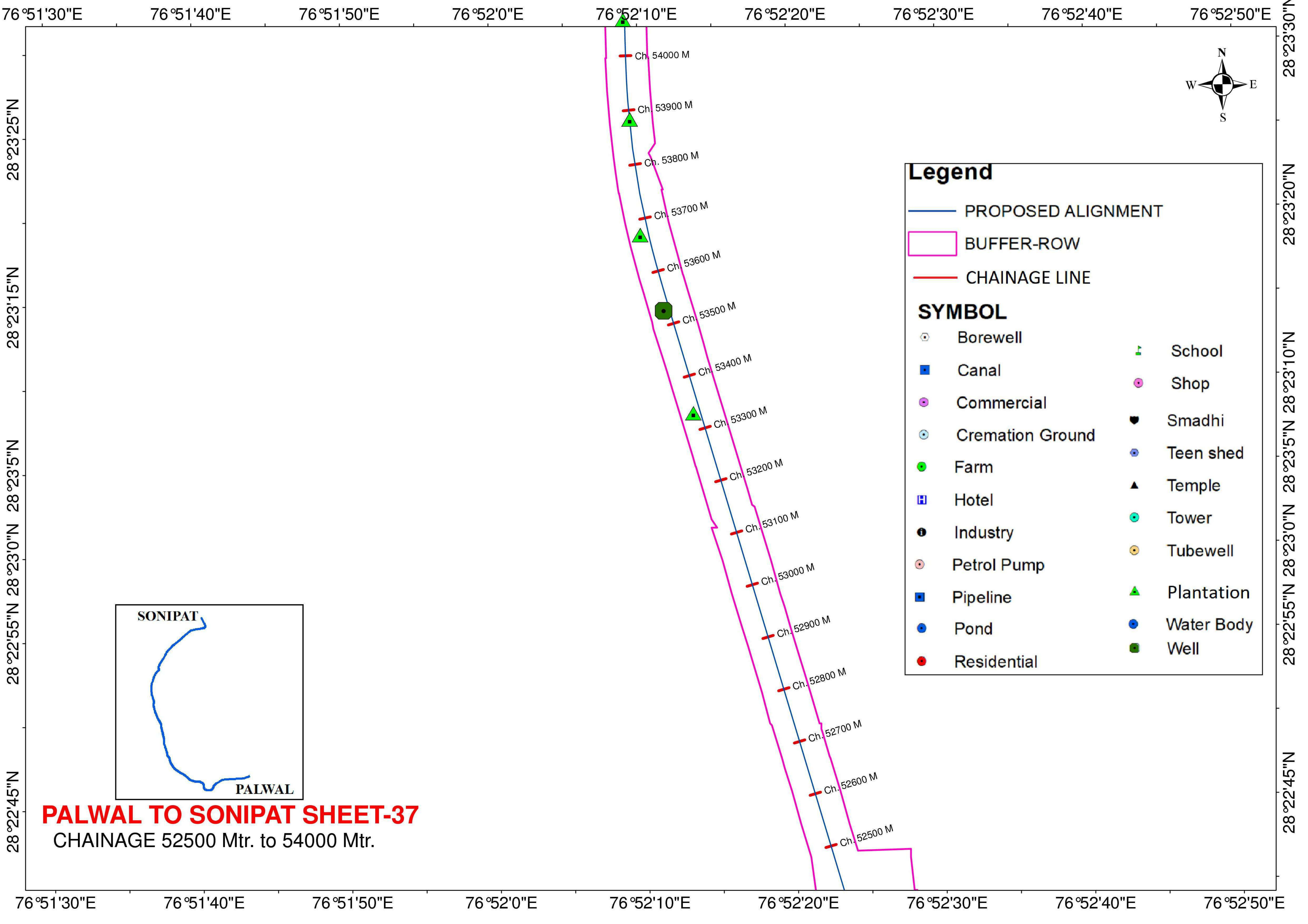
PALWAL TO SONIPAT SHEET-35
 CHAINAGE 49500 Mtr. to 51000 Mtr.

Ch. 51000 M
 Ch. 50900 M
 Ch. 50800 M
 Ch. 50700 M
 Ch. 50600 M
 Ch. 50500 M
 Ch. 50400 M
 Ch. 50300 M
 Ch. 50200 M
 Ch. 50100 M
 Ch. 50000 M
 Ch. 49900 M
 Ch. 49800 M
 Ch. 49700 M
 Ch. 49600 M
 Ch. 49500 M



PALWAL TO SONIPAT SHEET-36
 CHAINAGE 51000 Mtr. to 52500 Mtr.



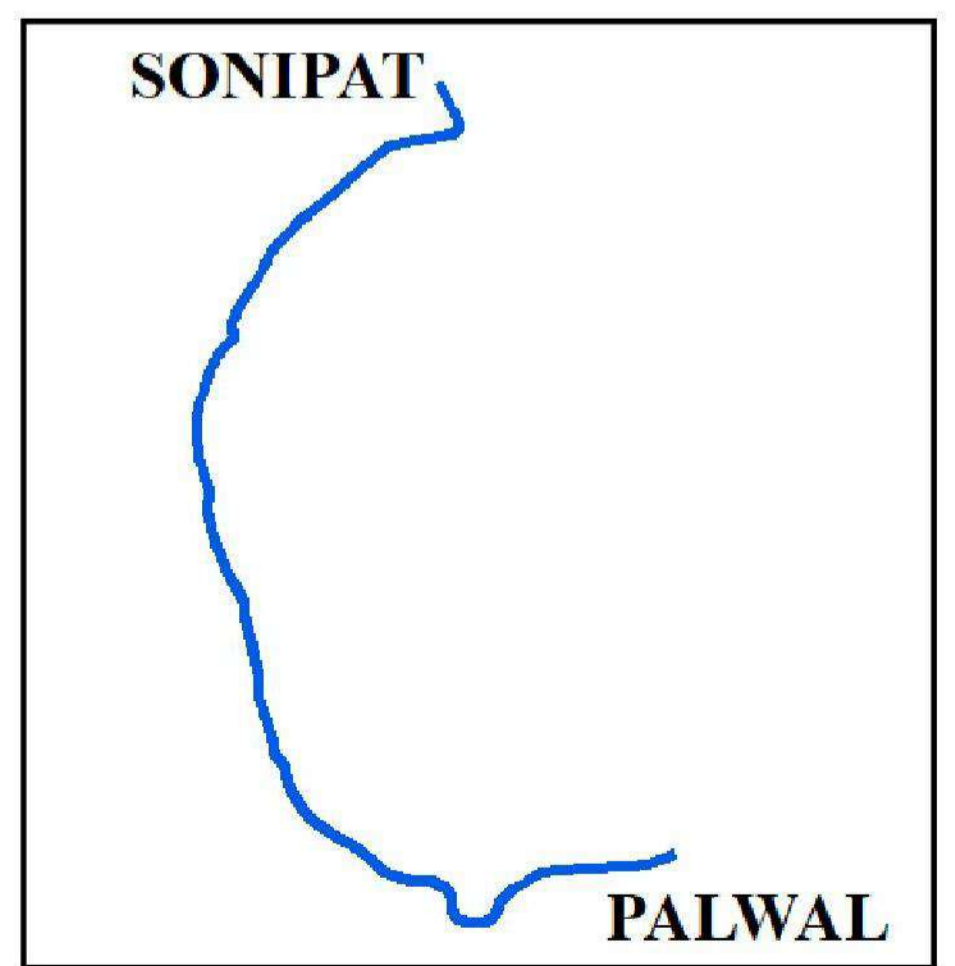


Legend

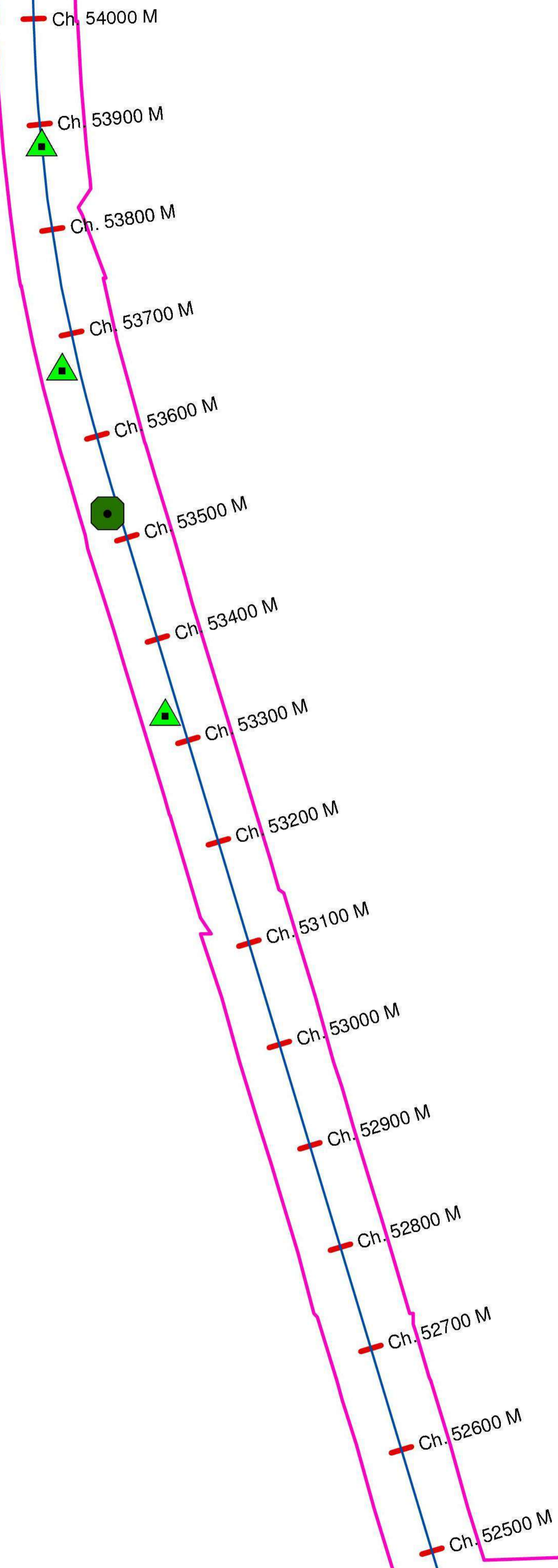
— PROPOSED ALIGNMENT
 BUFFER-ROW
- - - CHAINAGE LINE

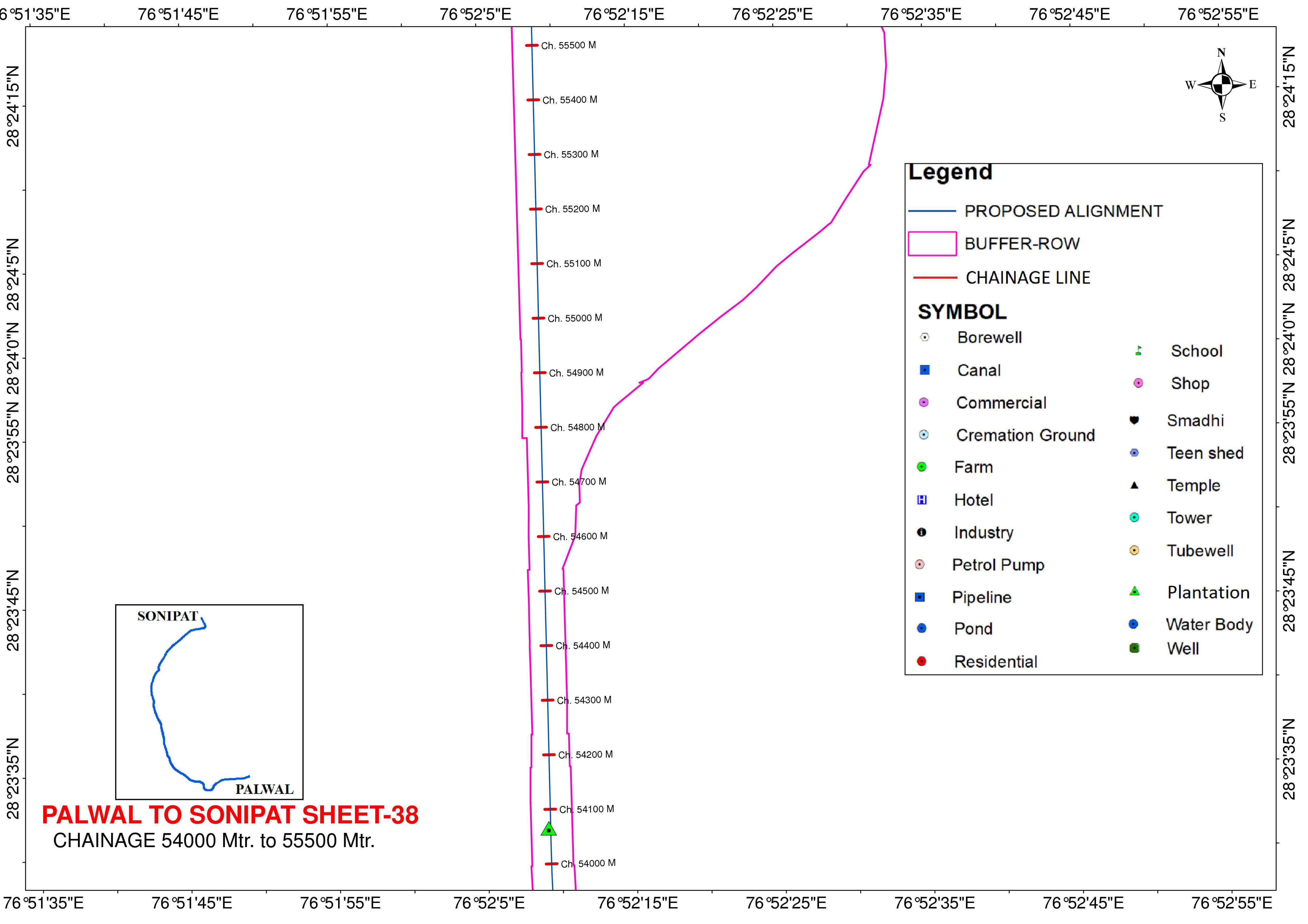
SYMBOL

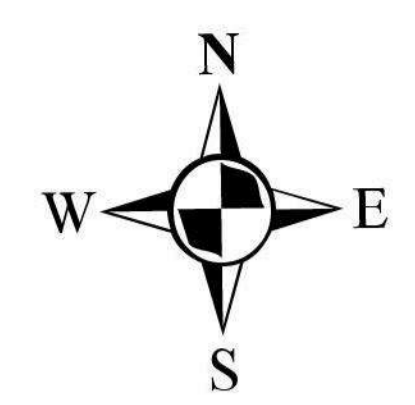
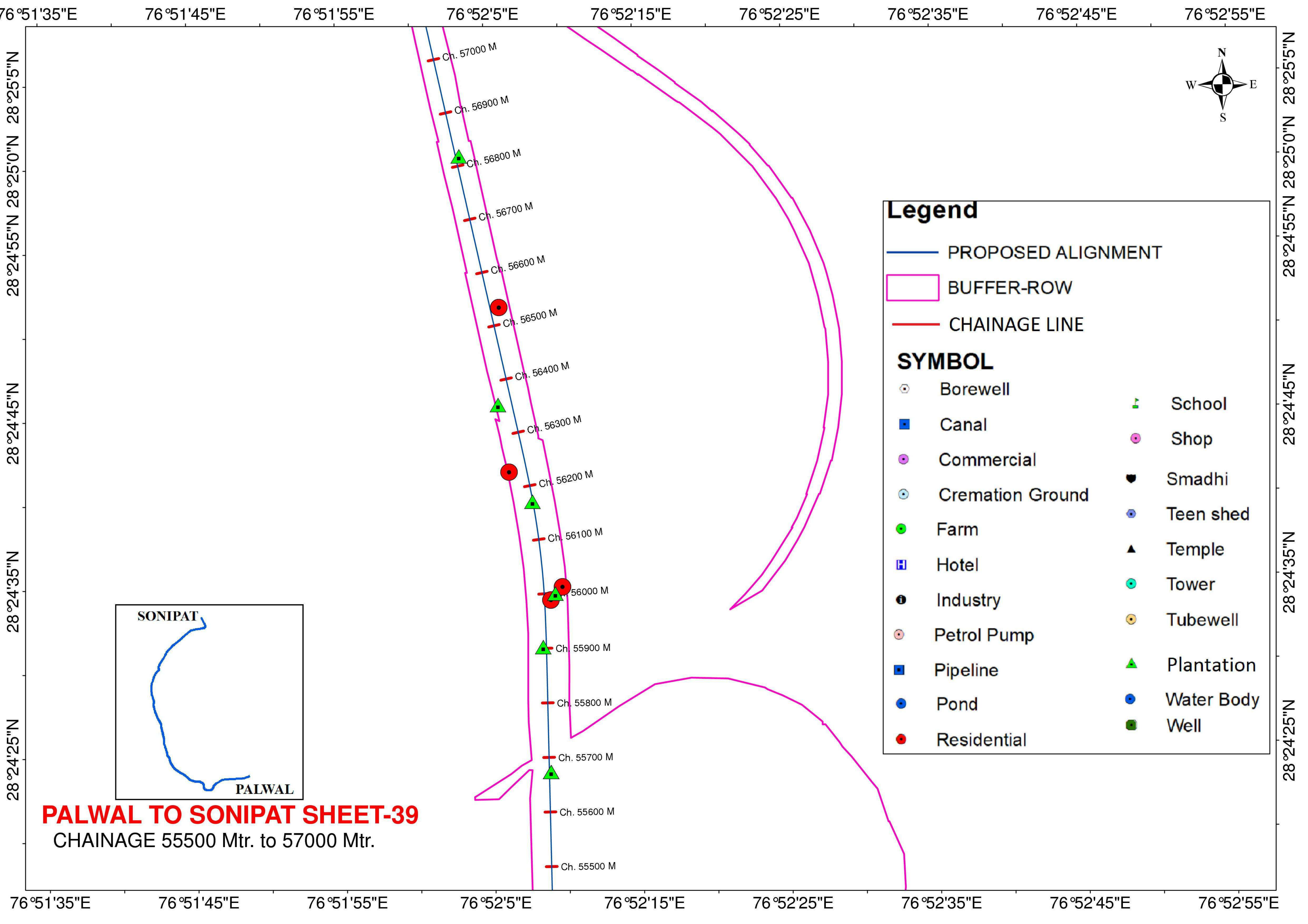
	Borewell		School
	Canal		Shop
	Commercial		Smadhi
	Cremation Ground		Teen shed
	Farm		Temple
	Hotel		Tower
	Industry		Tubewell
	Petrol Pump		Plantation
	Pipeline		Water Body
	Pond		Well
	Residential		



PALWAL TO SONIPAT SHEET-37
 CHAINAGE 52500 Mtr. to 54000 Mtr.





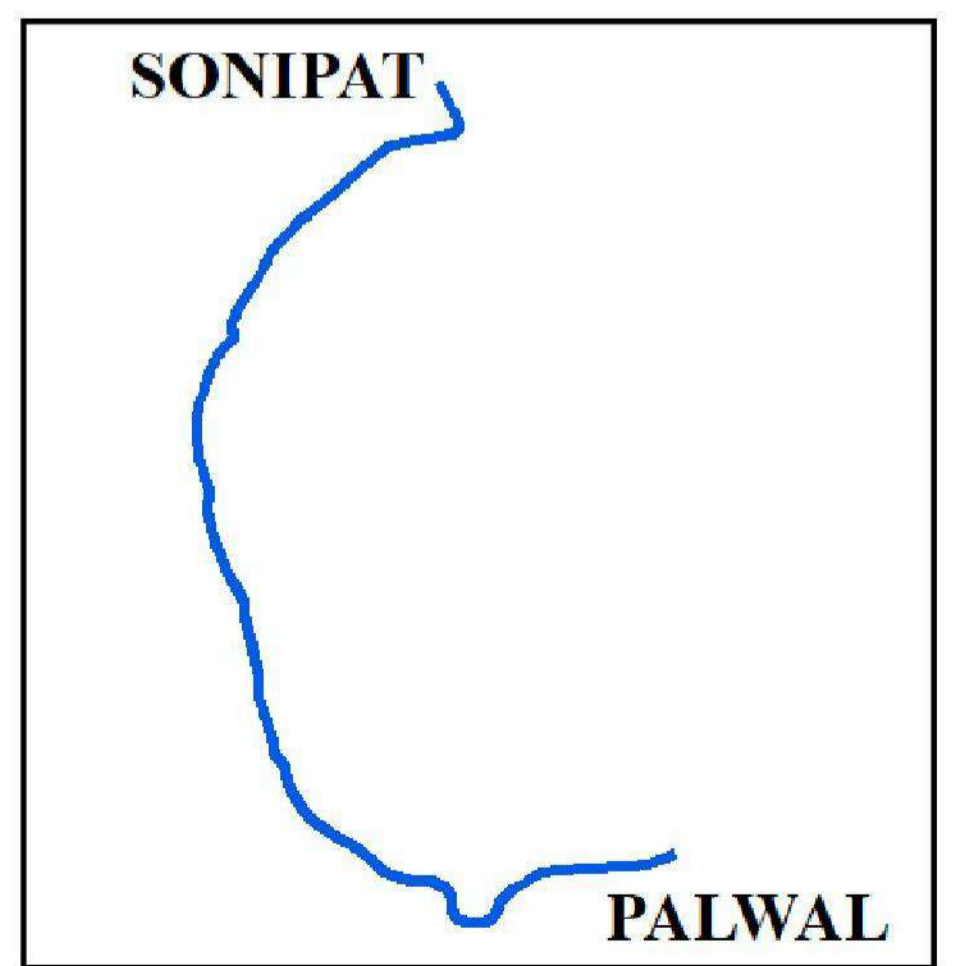


Legend

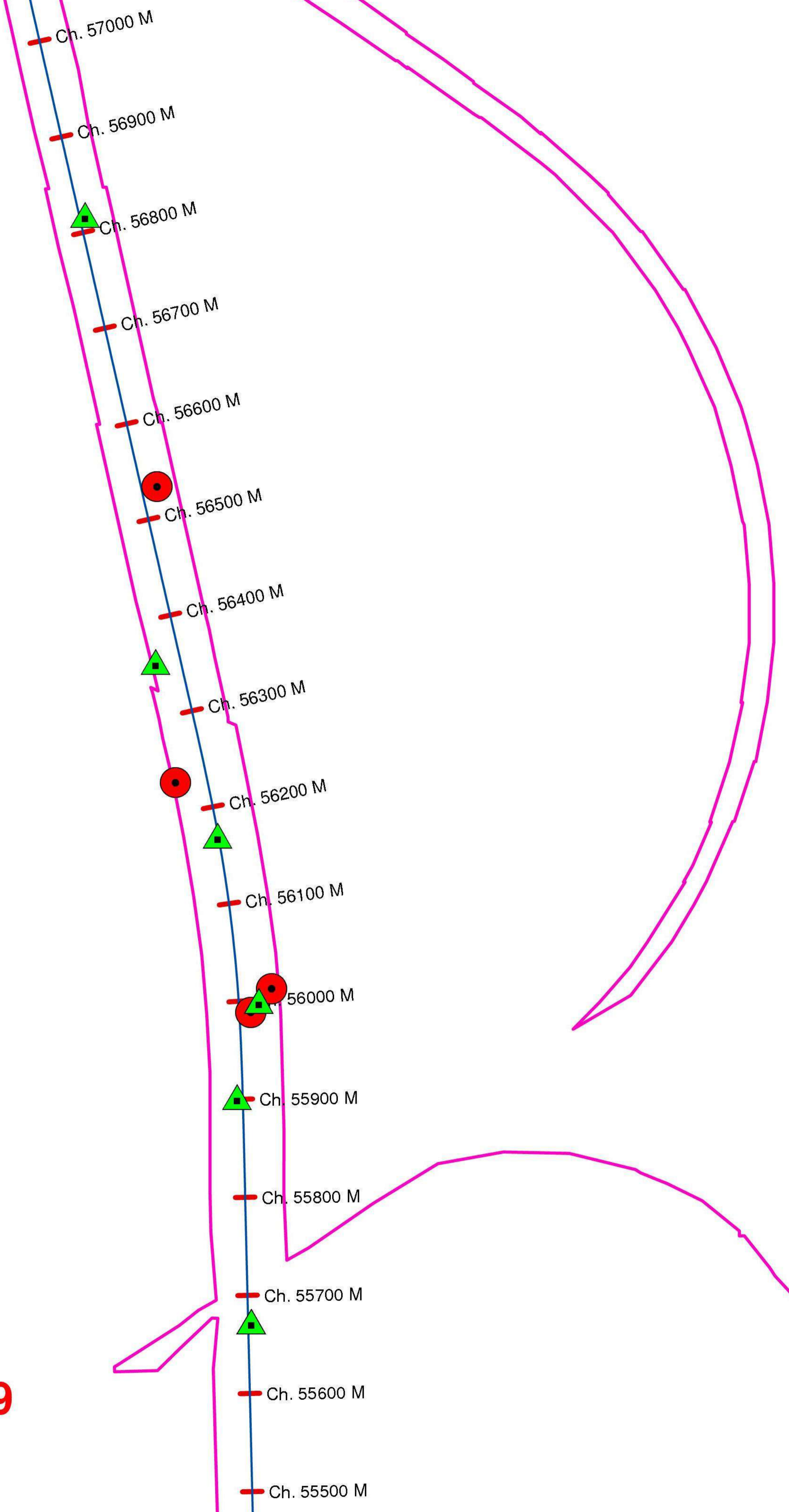
— PROPOSED ALIGNMENT
 BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

◊ Borewell	▲ School
■ Canal	● Shop
● Commercial	⬛ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

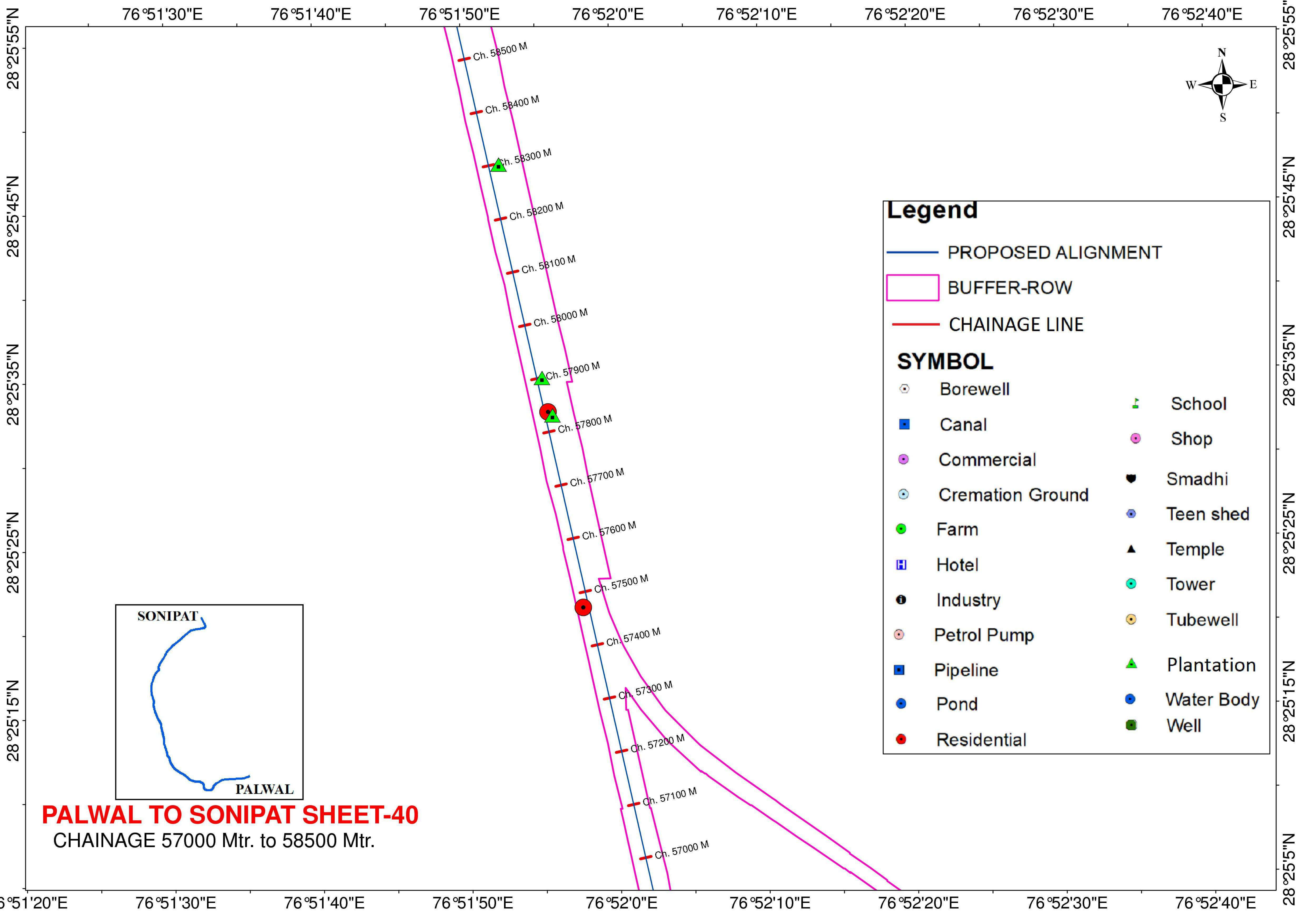


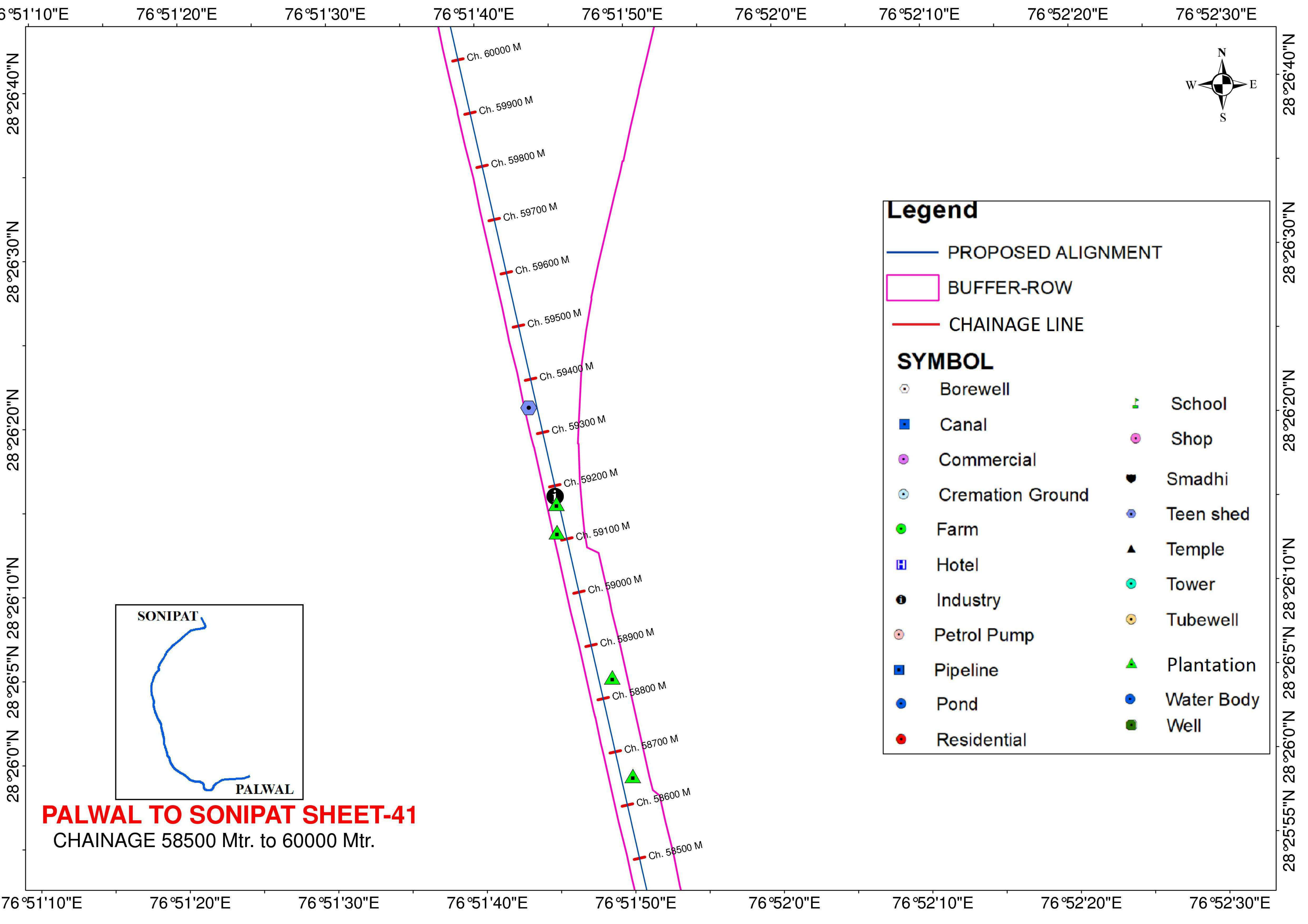
PALWAL TO SONIPAT SHEET-39
 CHAINAGE 55500 Mtr. to 57000 Mtr.

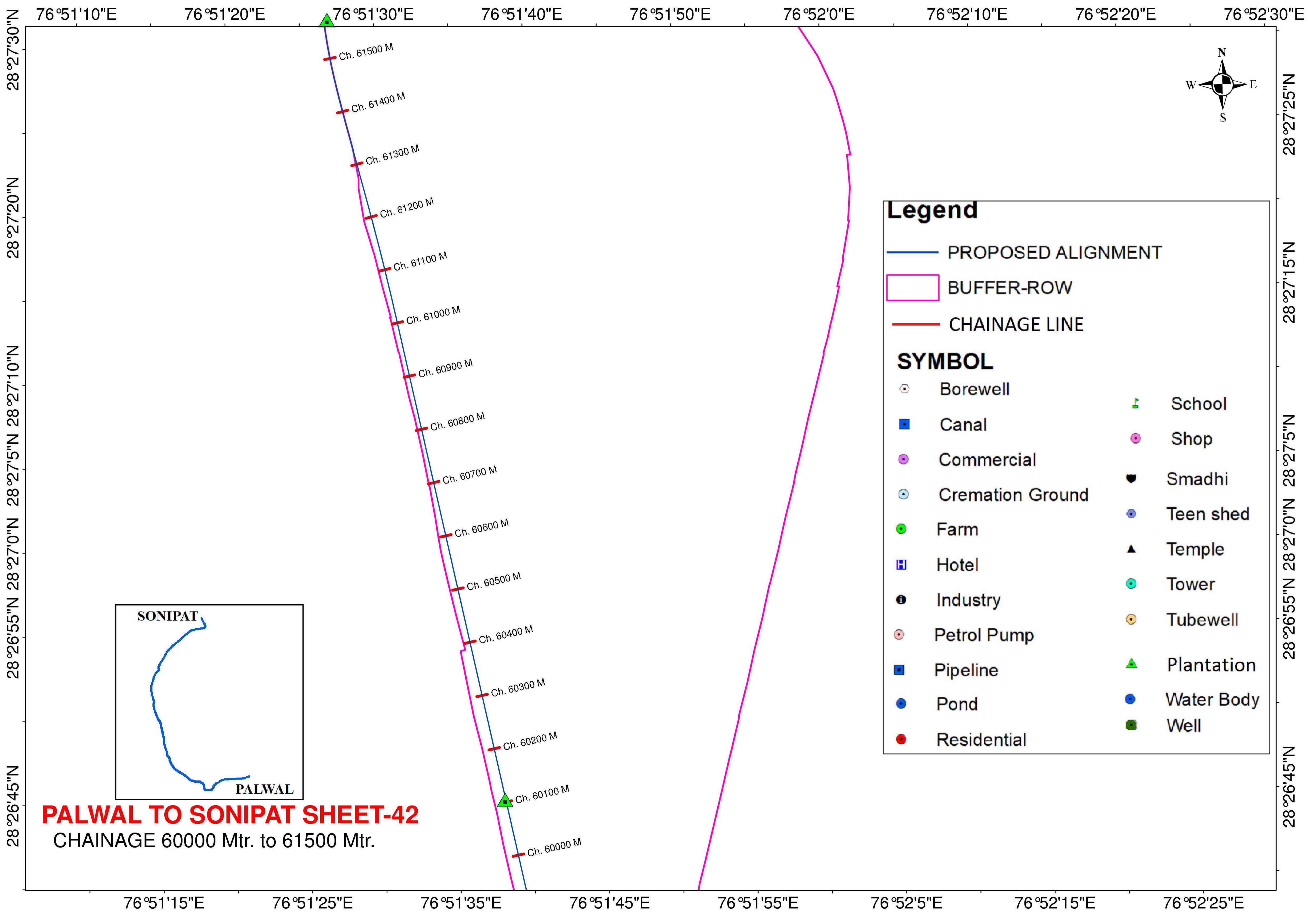


76°51'35"E 76°51'45"E 76°51'55"E 76°52'5"E 76°52'15"E 76°52'25"E 76°52'35"E 76°52'45"E 76°52'55"E

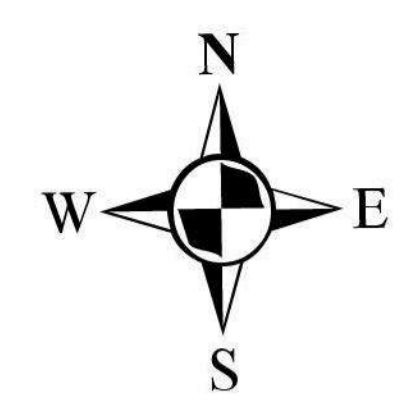
28°24'25"N 28°24'35"N 28°24'45"N 28°24'55"N 28°25'0"N 28°25'5"N







76°51'10"E 76°51'20"E 76°51'30"E 76°51'40"E 76°51'50"E 76°52'0"E 76°52'10"E 76°52'20"E 76°52'30"E

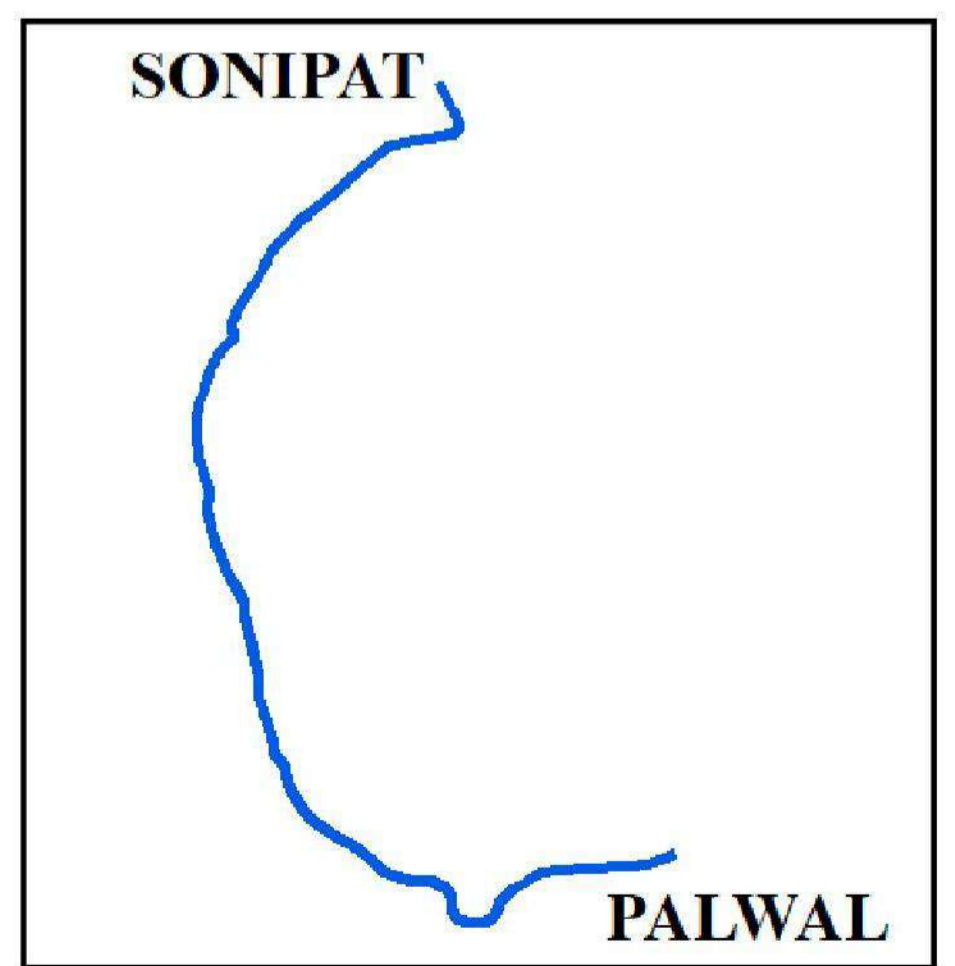


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

◊ Borewell	🏫 School
■ Canal	● Shop
● Commercial	☪ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
🏠 Hotel	● Tower
⦿ Industry	● Tubewell
⊙ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

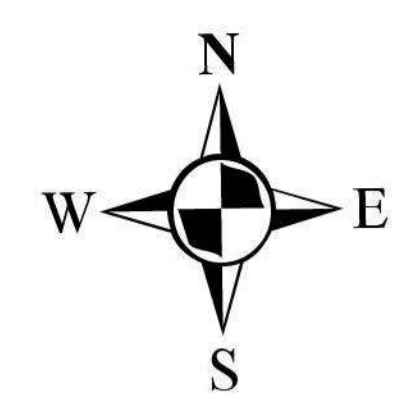
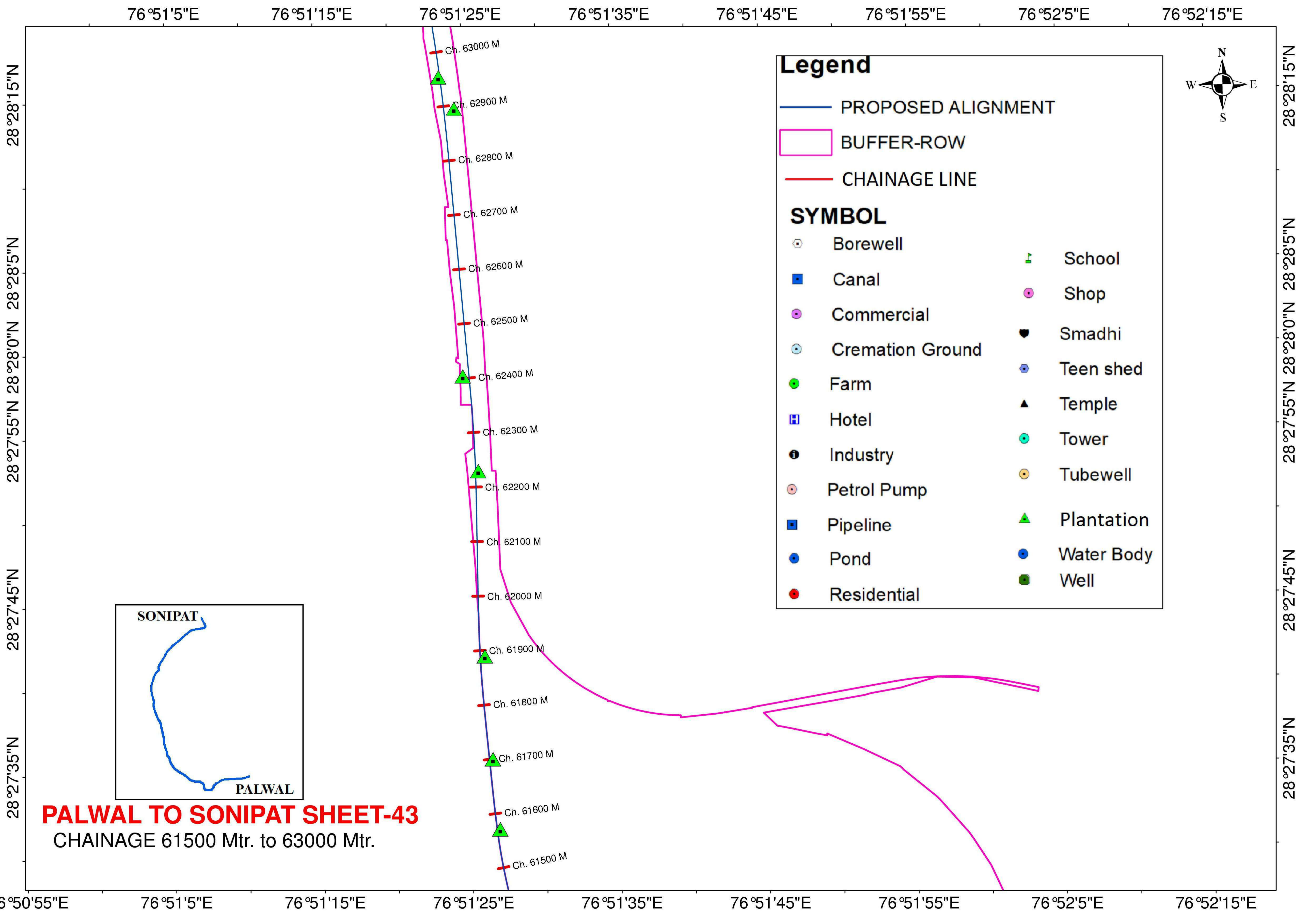


PALWAL TO SONIPAT SHEET-42
CHAINAGE 60000 Mtr. to 61500 Mtr.

28°27'30"N
28°27'25"N
28°27'20"N
28°27'15"N
28°27'10"N
28°27'5"N
28°27'0"N
28°26'55"N
28°26'50"N
28°26'45"N

Ch. 61500 M
Ch. 61400 M
Ch. 61300 M
Ch. 61200 M
Ch. 61100 M
Ch. 61000 M
Ch. 60900 M
Ch. 60800 M
Ch. 60700 M
Ch. 60600 M
Ch. 60500 M
Ch. 60400 M
Ch. 60300 M
Ch. 60200 M
Ch. 60100 M
Ch. 60000 M

76°51'15"E 76°51'25"E 76°51'35"E 76°51'45"E 76°51'55"E 76°52'5"E 76°52'15"E 76°52'25"E

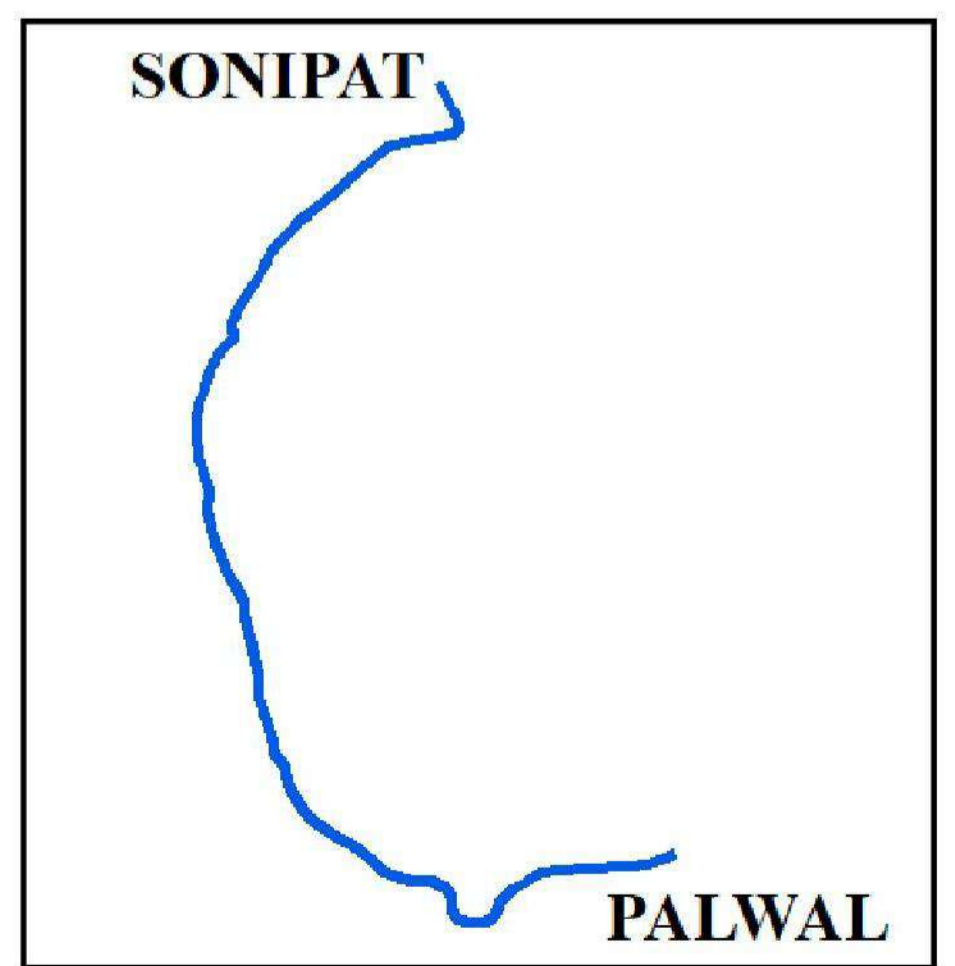


Legend

— PROPOSED ALIGNMENT
 BUFFER-ROW
— CHAINAGE LINE

SYMBOL

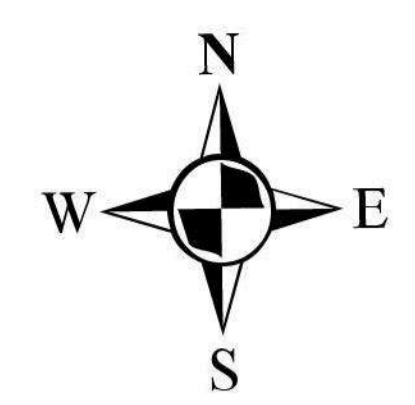
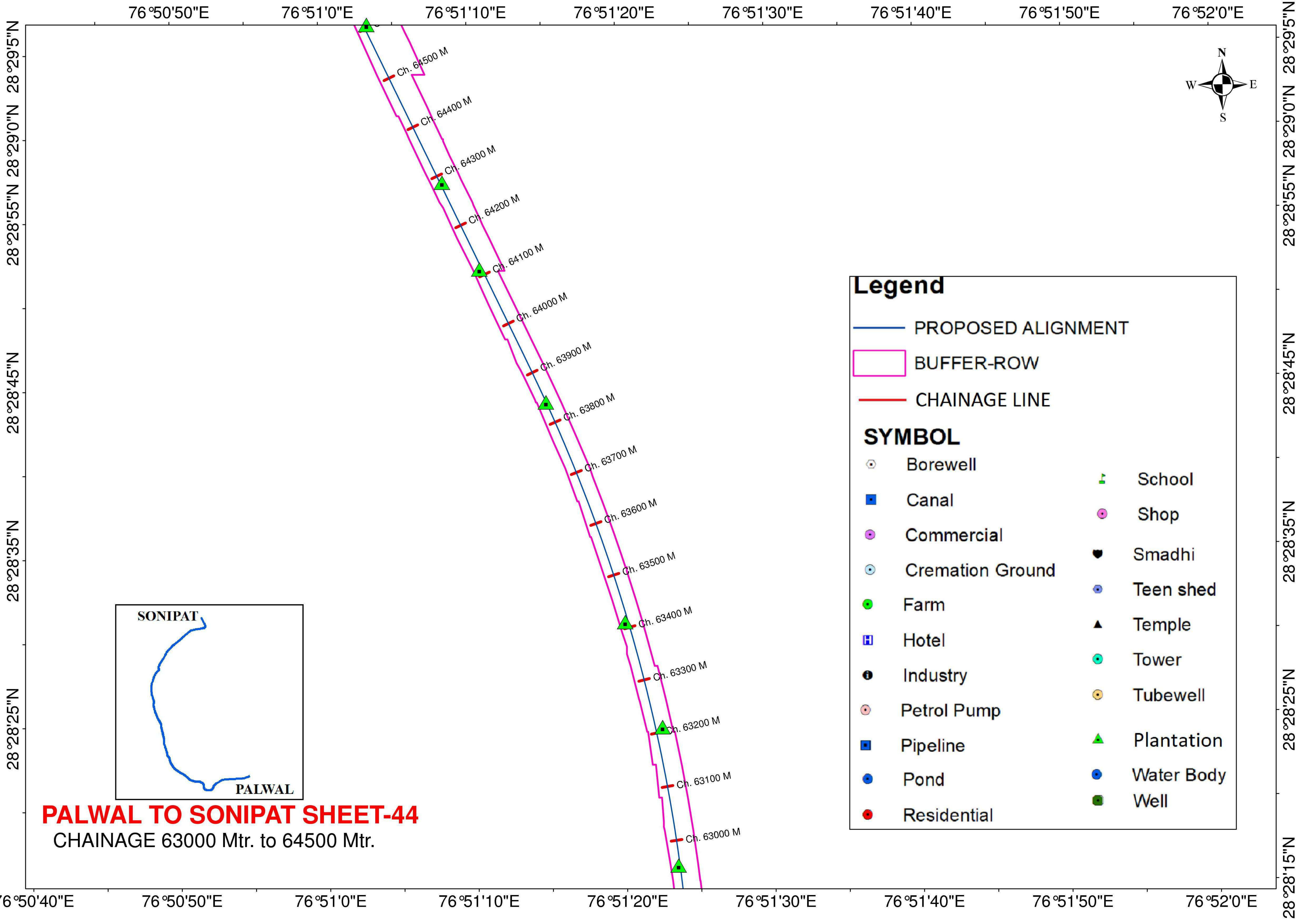
○ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
🏠 Hotel	● Tower
⦿ Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-43
 CHAINAGE 61500 Mtr. to 63000 Mtr.

Ch. 63000 M
 Ch. 62900 M
 Ch. 62800 M
 Ch. 62700 M
 Ch. 62600 M
 Ch. 62500 M
 Ch. 62400 M
 Ch. 62300 M
 Ch. 62200 M
 Ch. 62100 M
 Ch. 62000 M
 Ch. 61900 M
 Ch. 61800 M
 Ch. 61700 M
 Ch. 61600 M
 Ch. 61500 M

76°51'5"E 76°51'15"E 76°51'25"E 76°51'35"E 76°51'45"E 76°51'55"E 76°52'5"E 76°52'15"E
 28°28'15"N
 28°28'5"N
 28°28'0"N
 28°27'55"N
 28°27'45"N
 28°27'35"N
 76°50'55"E 76°51'5"E 76°51'15"E 76°51'25"E 76°51'35"E 76°51'45"E 76°51'55"E 76°52'5"E 76°52'15"E

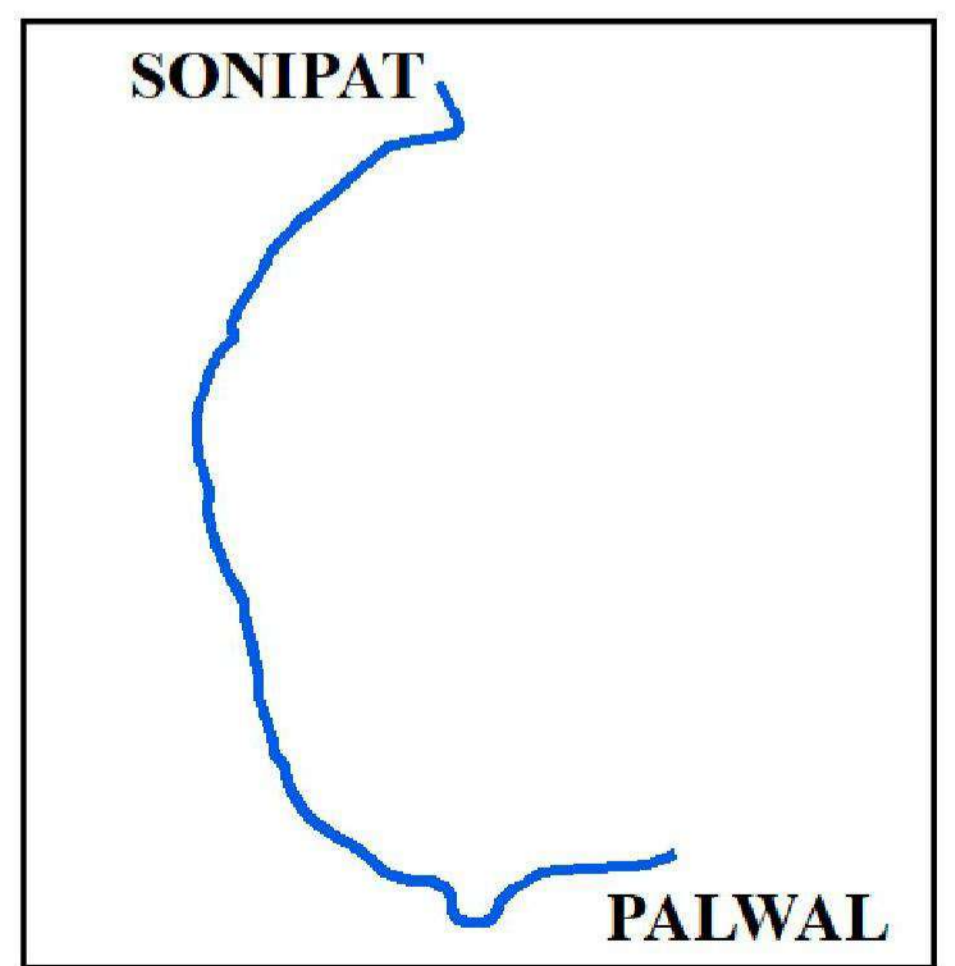


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

 Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
 Cremation Ground	● Teen shed
● Farm	▲ Temple
H Hotel	● Tower
● Industry	 Tubewell
 Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



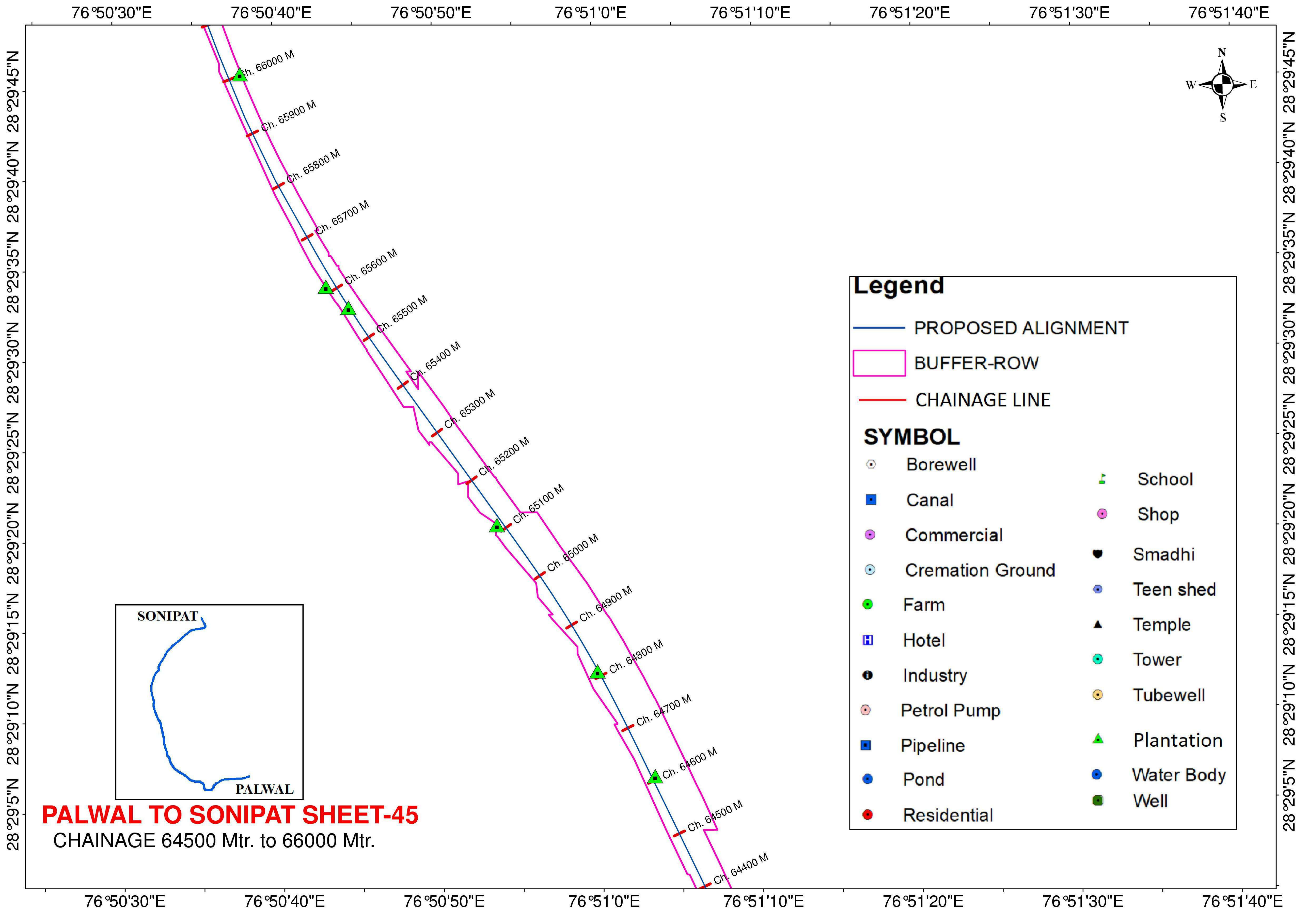
PALWAL TO SONIPAT SHEET-44
CHAINAGE 63000 Mtr. to 64500 Mtr.

76°50'50"E 76°51'0"E 76°51'10"E 76°51'20"E 76°51'30"E 76°51'40"E 76°51'50"E 76°52'0"E

28°28'15"N 28°28'25"N 28°28'35"N 28°28'45"N 28°28'55"N 28°29'0"N 28°29'5"N

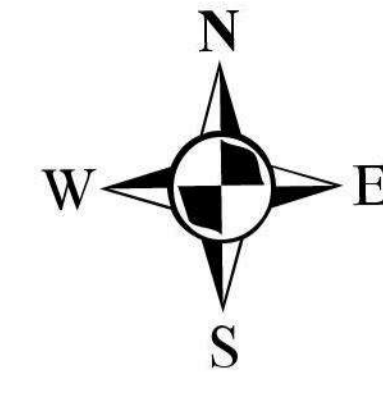
6°50'40"E 76°50'50"E 76°51'0"E 76°51'10"E 76°51'20"E 76°51'30"E 76°51'40"E 76°51'50"E 76°52'0"E

28°28'15"N 28°28'25"N 28°28'35"N 28°28'45"N 28°28'55"N 28°29'0"N 28°29'5"N



76°50'30"E 76°50'40"E 76°50'50"E 76°51'0"E 76°51'10"E 76°51'20"E 76°51'30"E 76°51'40"E

28°29'5"N 28°29'10"N 28°29'15"N 28°29'20"N 28°29'25"N 28°29'30"N 28°29'35"N 28°29'40"N 28°29'45"N

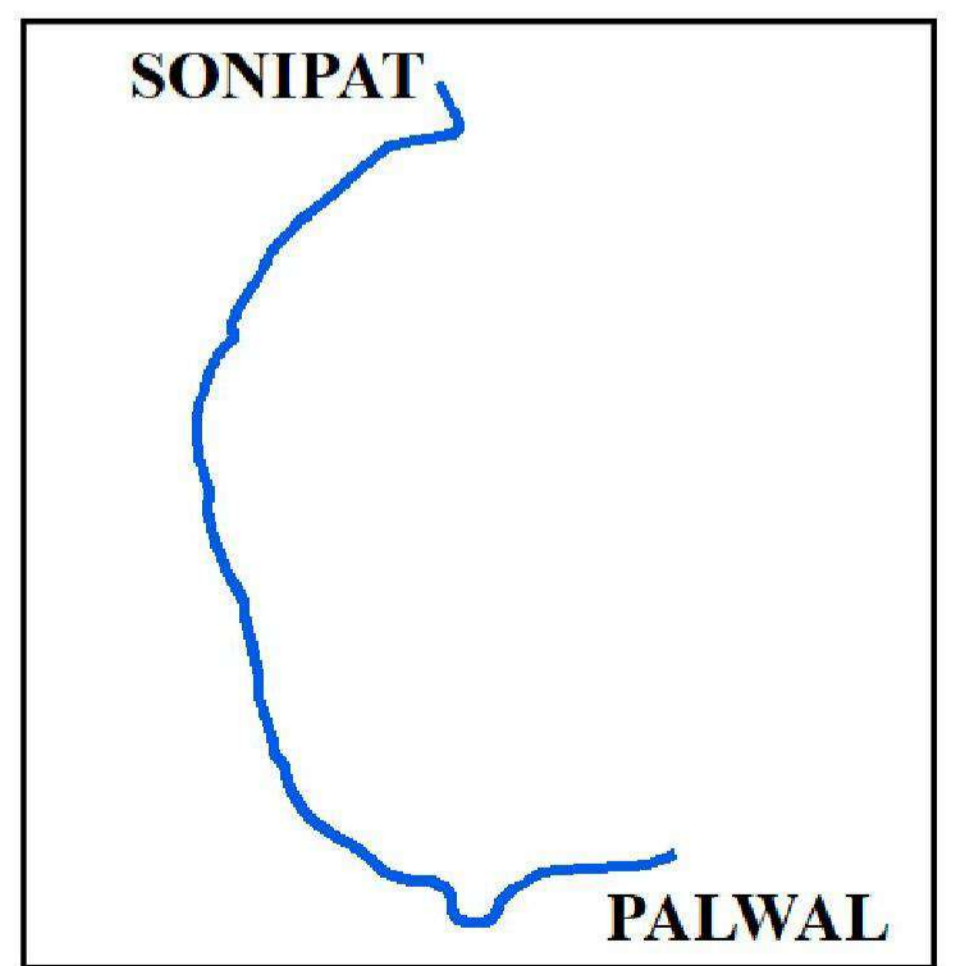


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

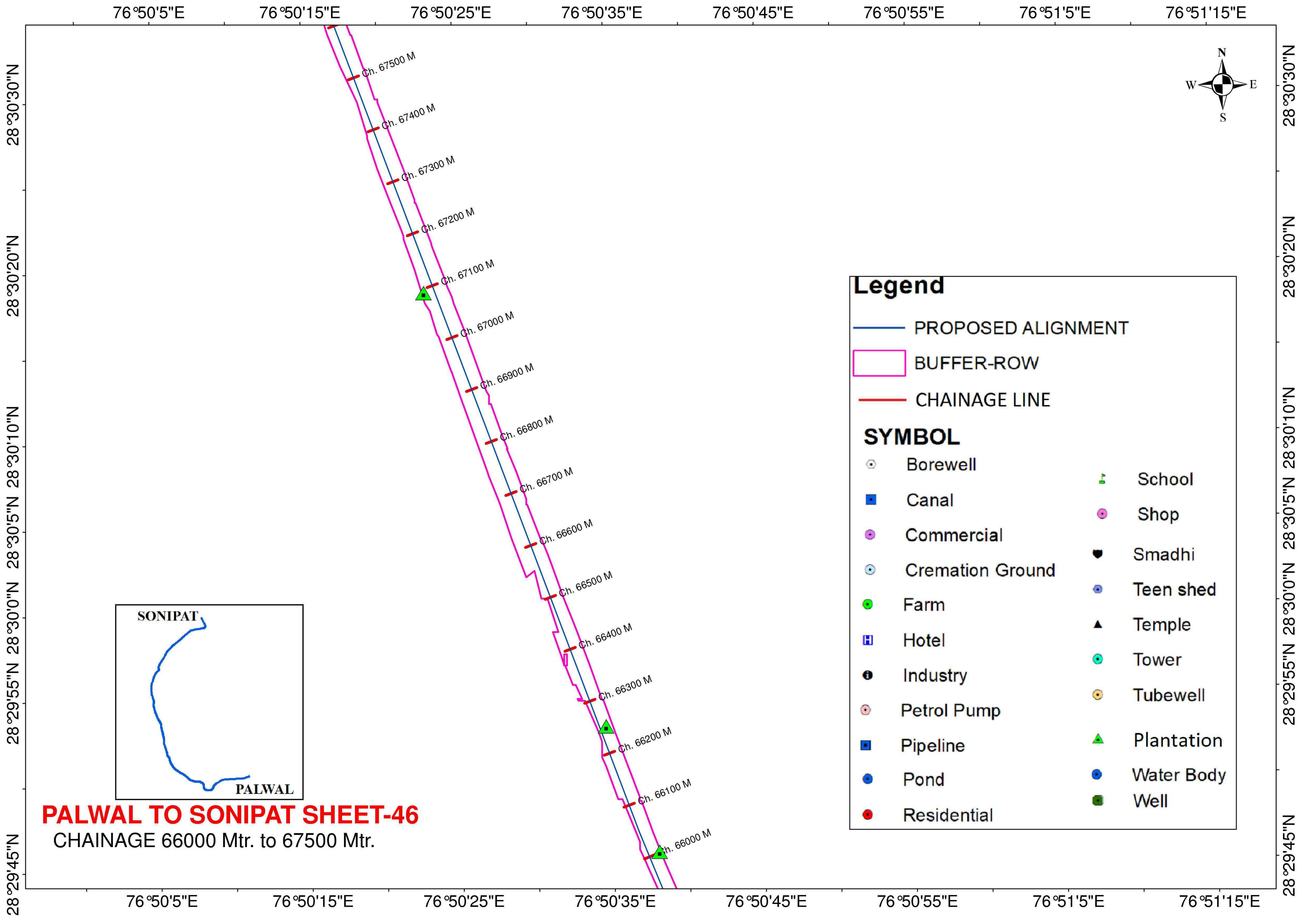
○ Borewell	▲ School
■ Canal	○ Shop
○ Commercial	♣ Smadhi
○ Cremation Ground	○ Teen shed
● Farm	▲ Temple
■ Hotel	○ Tower
● Industry	○ Tubewell
○ Petrol Pump	▲ Plantation
■ Pipeline	○ Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-45
CHAINAGE 64500 Mtr. to 66000 Mtr.

76°50'30"E 76°50'40"E 76°50'50"E 76°51'0"E 76°51'10"E 76°51'20"E 76°51'30"E 76°51'40"E

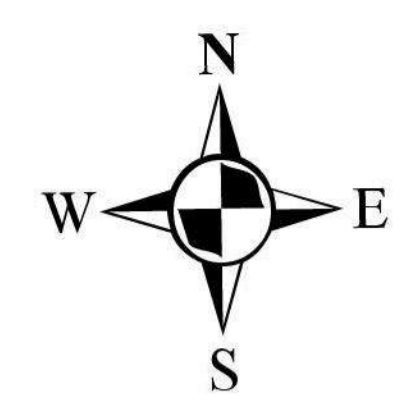
28°29'5"N 28°29'10"N 28°29'15"N 28°29'20"N 28°29'25"N 28°29'30"N 28°29'35"N 28°29'40"N 28°29'45"N



76°50'5"E 76°50'15"E 76°50'25"E 76°50'35"E 76°50'45"E 76°50'55"E 76°51'5"E 76°51'15"E

28°30'30"N
28°30'20"N
28°30'10"N
28°30'5"N
28°30'0"N
28°29'55"N
28°29'45"N

28°30'30"N
28°30'20"N
28°30'10"N
28°30'5"N
28°30'0"N
28°29'55"N
28°29'45"N

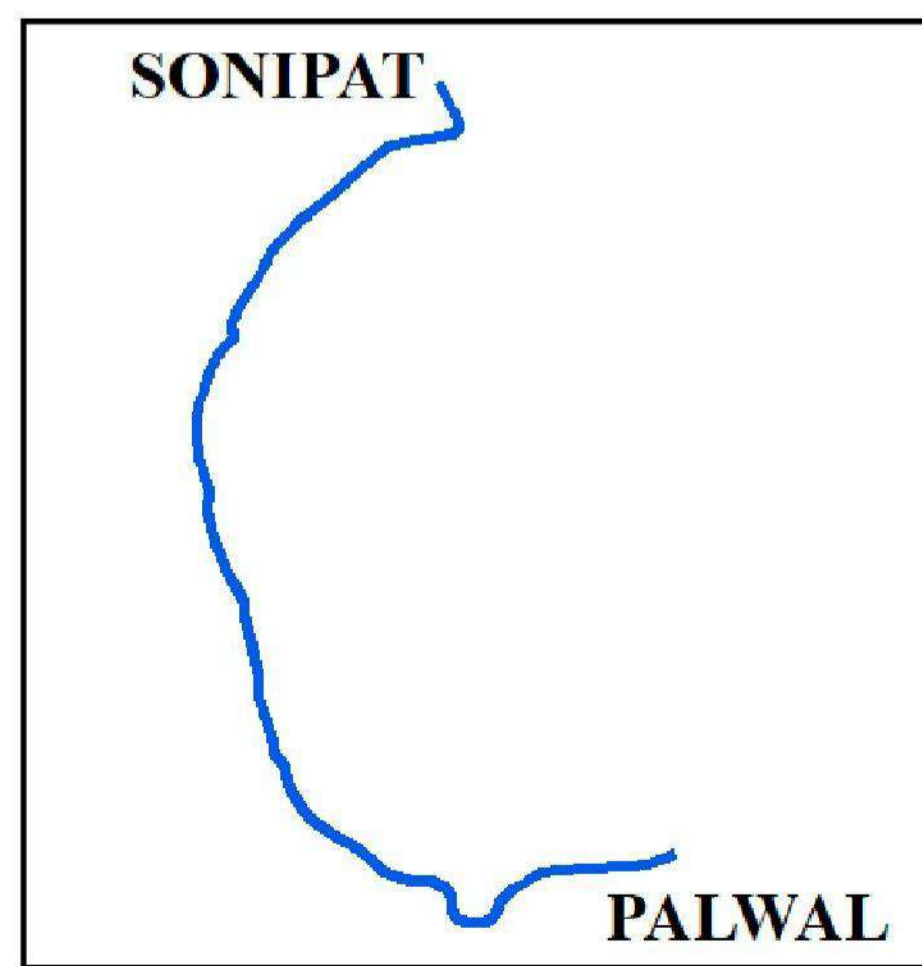


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

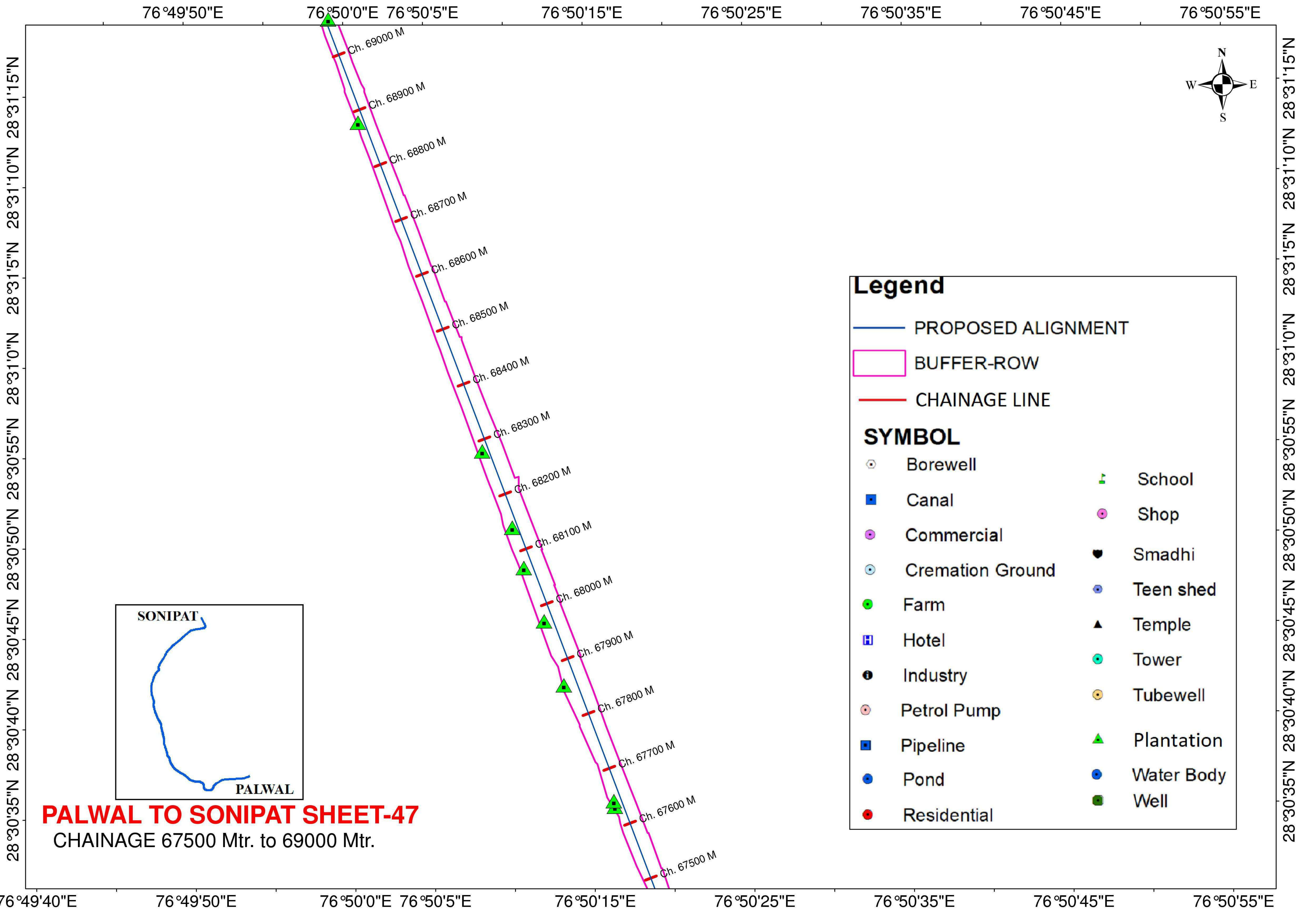
SYMBOL

 Borewell	▲ School
 Canal	 Shop
 Commercial	 Smadhi
 Cremation Ground	 Teen shed
 Farm	 Temple
 Hotel	 Tower
 Industry	 Tubewell
 Petrol Pump	▲ Plantation
 Pipeline	 Water Body
 Pond	 Well
 Residential	



PALWAL TO SONIPAT SHEET-46
CHAINAGE 66000 Mtr. to 67500 Mtr.

76°50'5"E 76°50'15"E 76°50'25"E 76°50'35"E 76°50'45"E 76°50'55"E 76°51'5"E 76°51'15"E



76°49'50"E

76°50'0"E 76°50'5"E

76°50'15"E

76°50'25"E

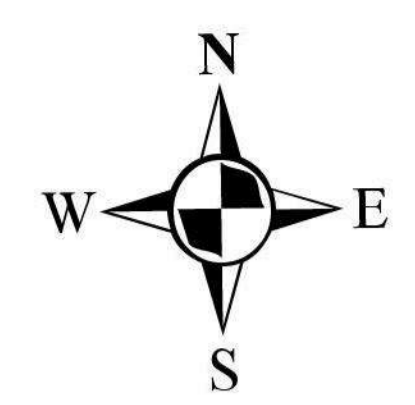
76°50'35"E

76°50'45"E

76°50'55"E

28°30'35"N
28°30'40"N
28°30'45"N
28°30'50"N
28°30'55"N
28°31'0"N
28°31'5"N
28°31'10"N
28°31'15"N

28°30'35"N
28°30'40"N
28°30'45"N
28°30'50"N
28°30'55"N
28°31'0"N
28°31'5"N
28°31'10"N
28°31'15"N

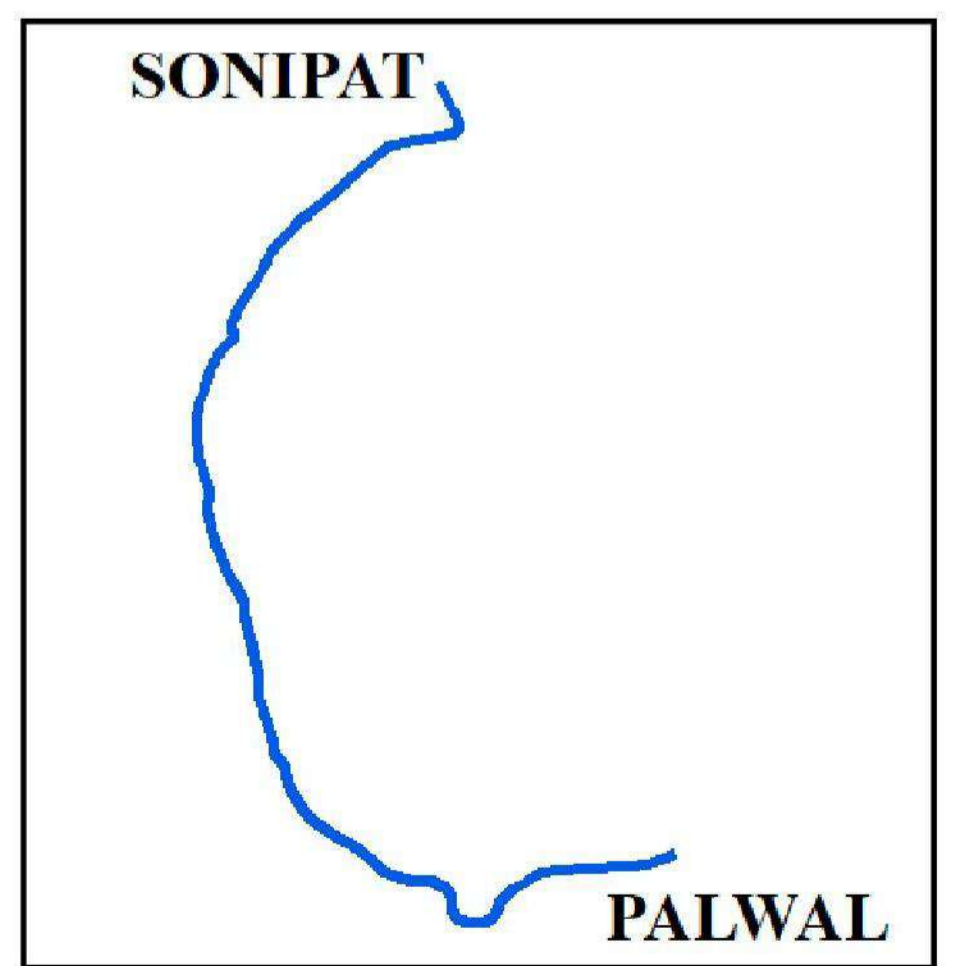


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

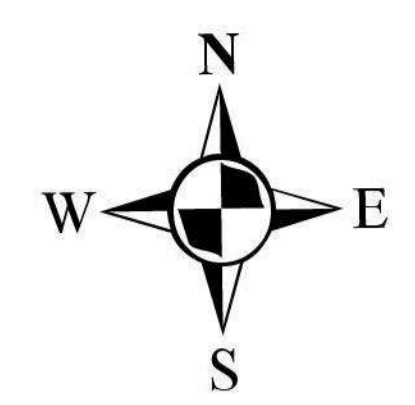
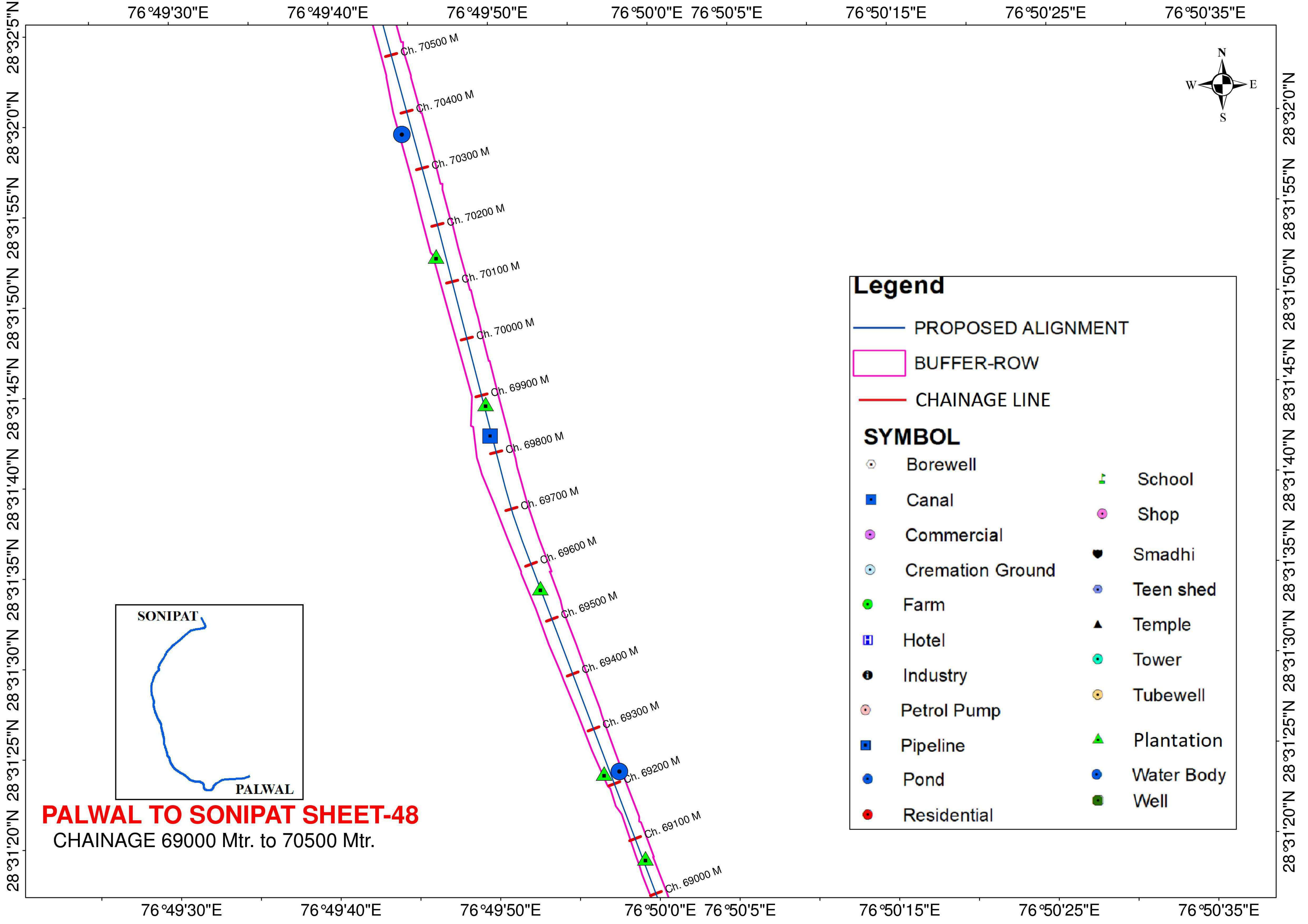
SYMBOL

- | | |
|--|---|
| ○ Borewell | ▲ School |
| ■ Canal | ● Shop |
| ● Commercial | ♣ Smadhi |
| ○ Cremation Ground | ● Teen shed |
| ● Farm | ▲ Temple |
| ■ Hotel | ● Tower |
| ● Industry | ● Tubewell |
| ● Petrol Pump | ▲ Plantation |
| ■ Pipeline | ● Water Body |
| ● Pond | ■ Well |
| ● Residential | |



PALWAL TO SONIPAT SHEET-47
CHAINAGE 67500 Mtr. to 69000 Mtr.

76°49'40"E 76°49'50"E 76°50'0"E 76°50'5"E 76°50'15"E 76°50'25"E 76°50'35"E 76°50'45"E 76°50'55"E

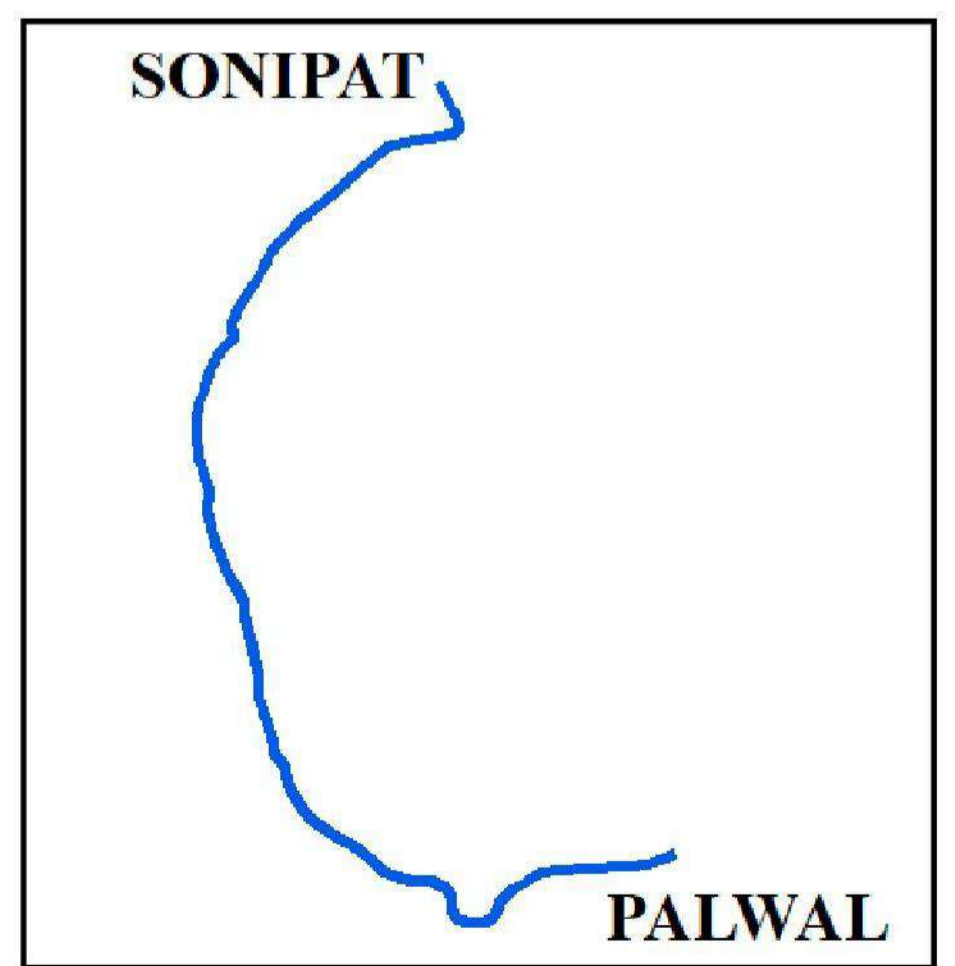


Legend

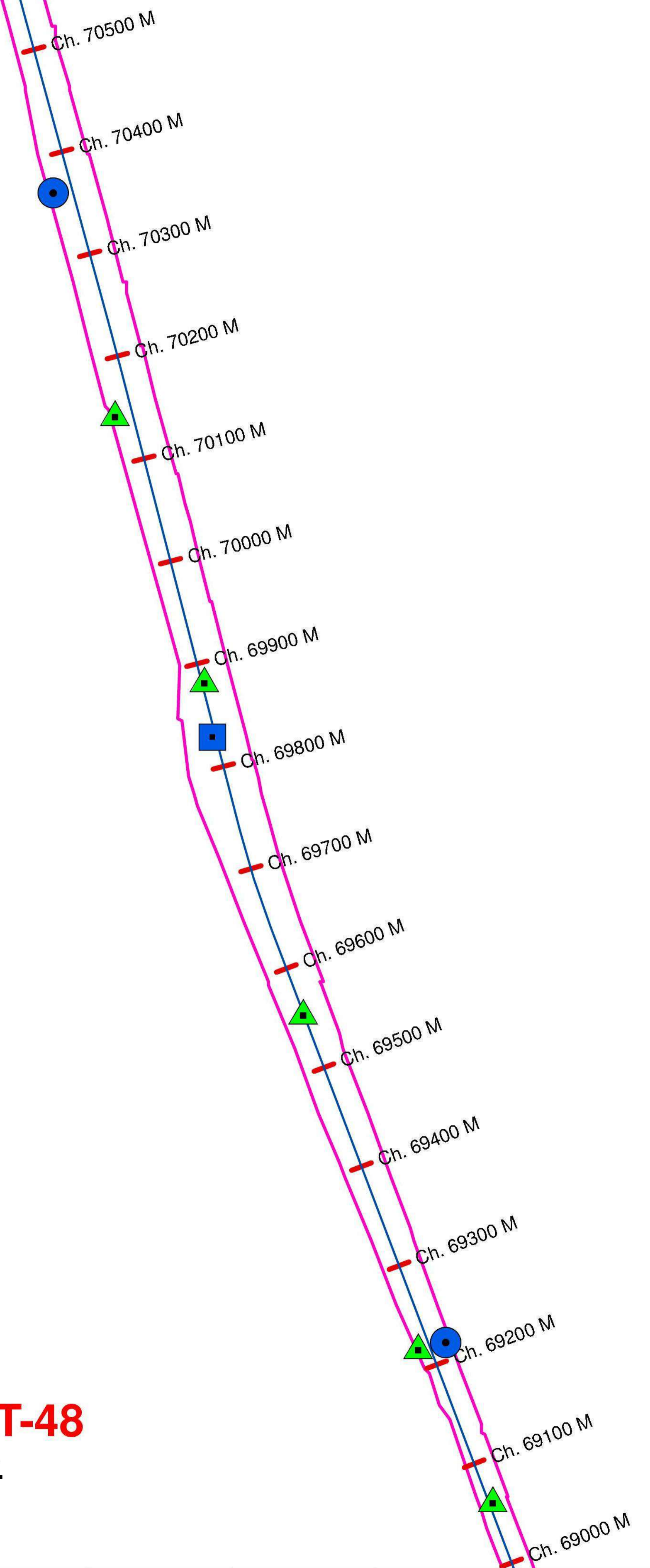
- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

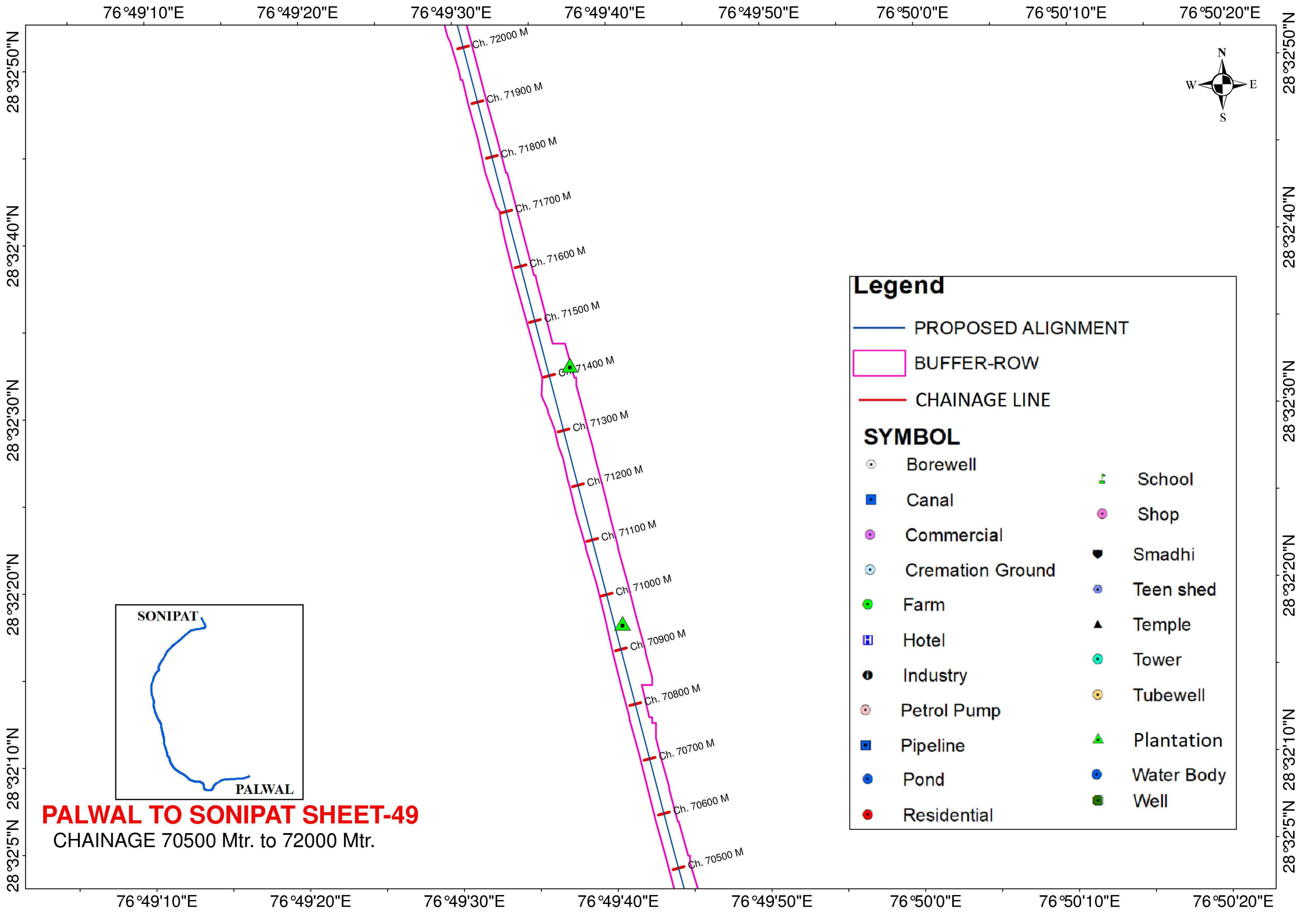
SYMBOL

⊙ Borewell	▲ School
■ Canal	⊙ Shop
⊙ Commercial	♣ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	⊙ Tubewell
⊙ Petrol Pump	▲ Plantation
■ Pipeline	⊙ Water Body
⊙ Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-48
 CHAINAGE 69000 Mtr. to 70500 Mtr.

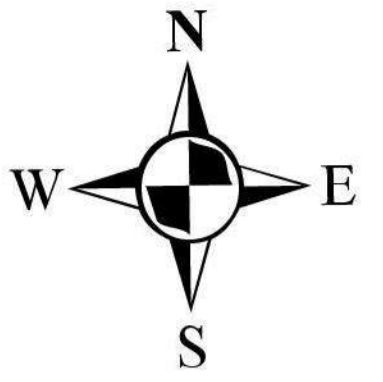




76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E 76°50'10"E 76°50'20"E

28°32'50"N
28°32'40"N
28°32'30"N
28°32'20"N
28°32'10"N
28°32'5"N

28°32'50"N
28°32'40"N
28°32'30"N
28°32'20"N
28°32'10"N
28°32'5"N

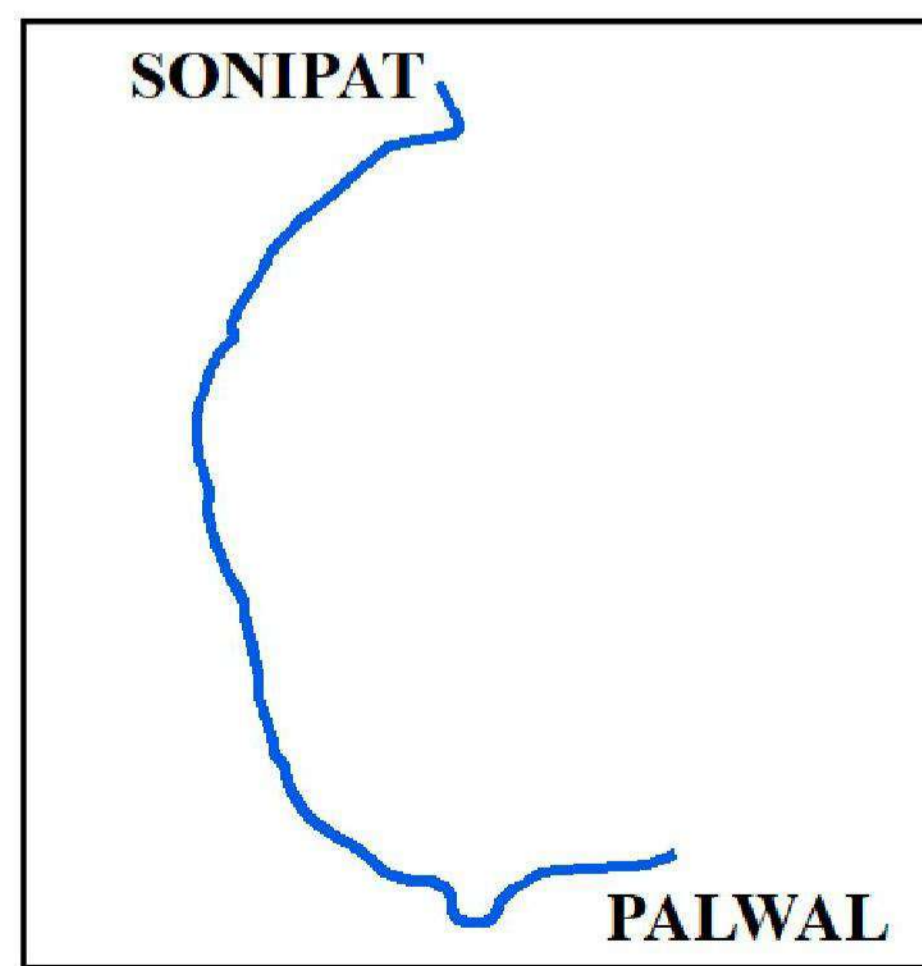


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

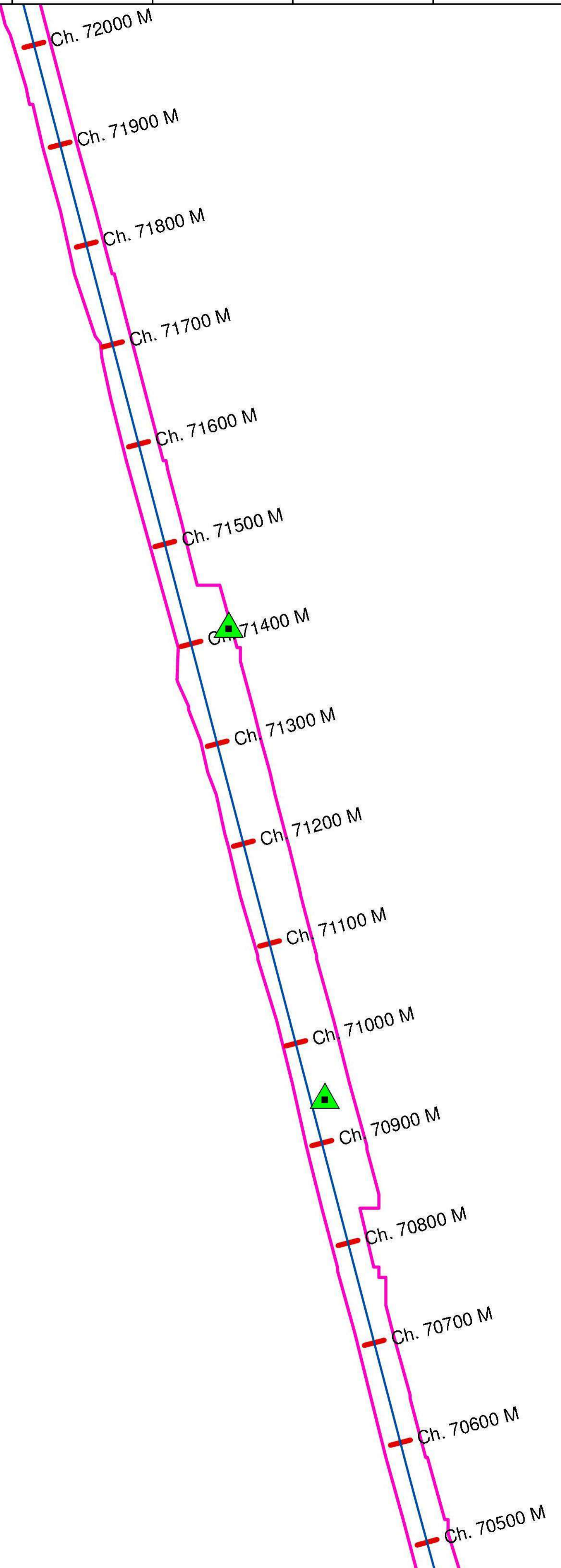
SYMBOL

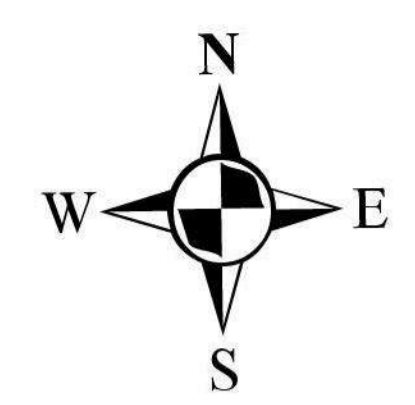
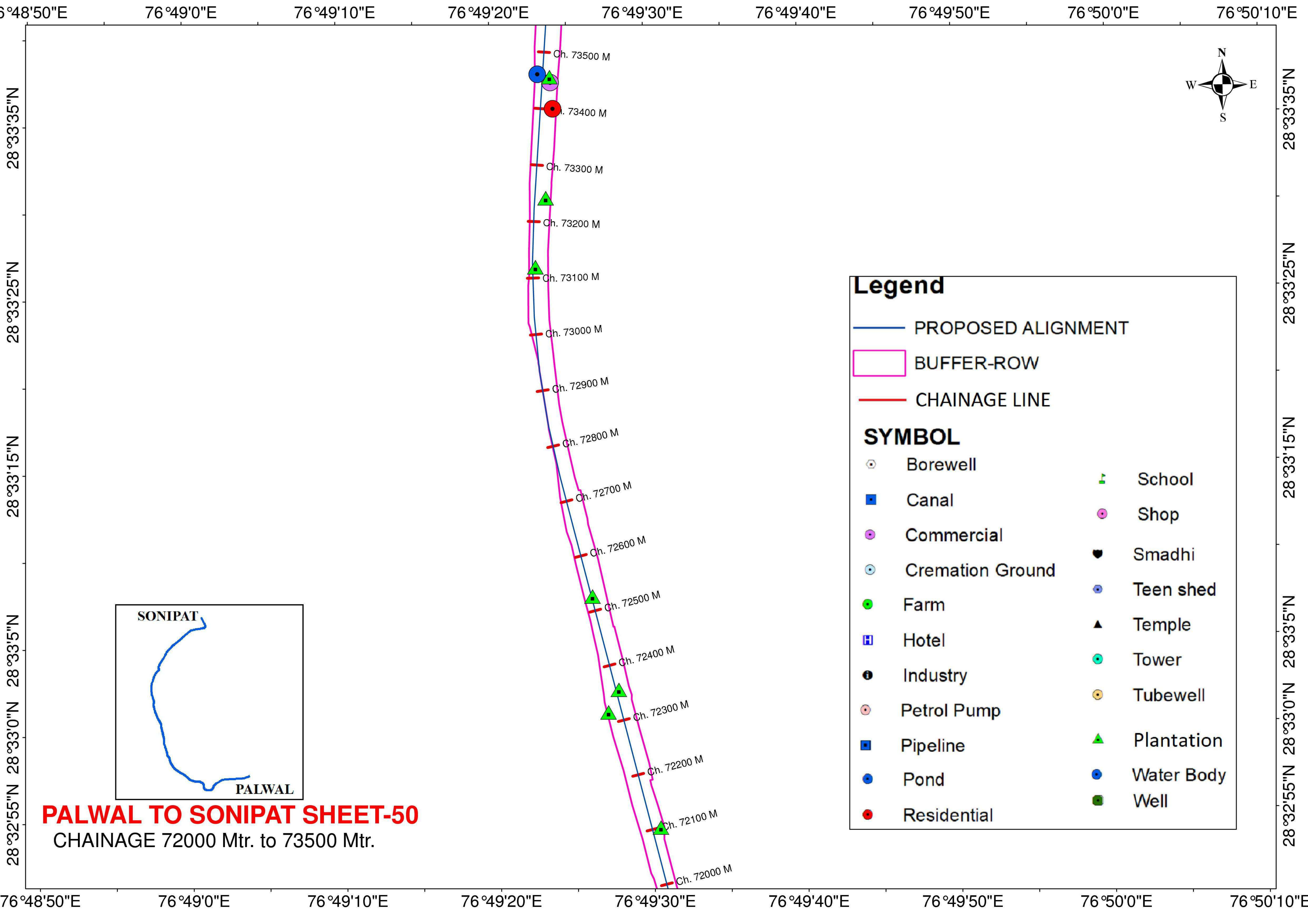
⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-49
CHAINAGE 70500 Mtr. to 72000 Mtr.

76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E 76°50'10"E 76°50'20"E



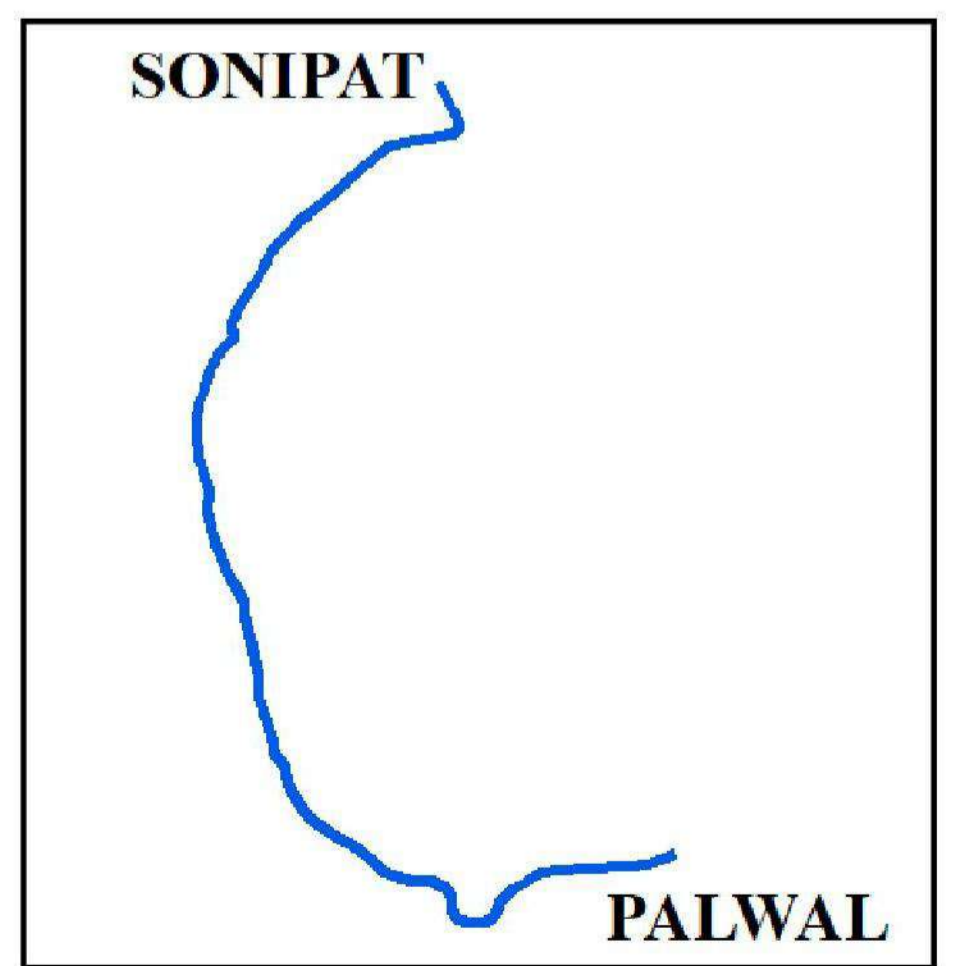


Legend

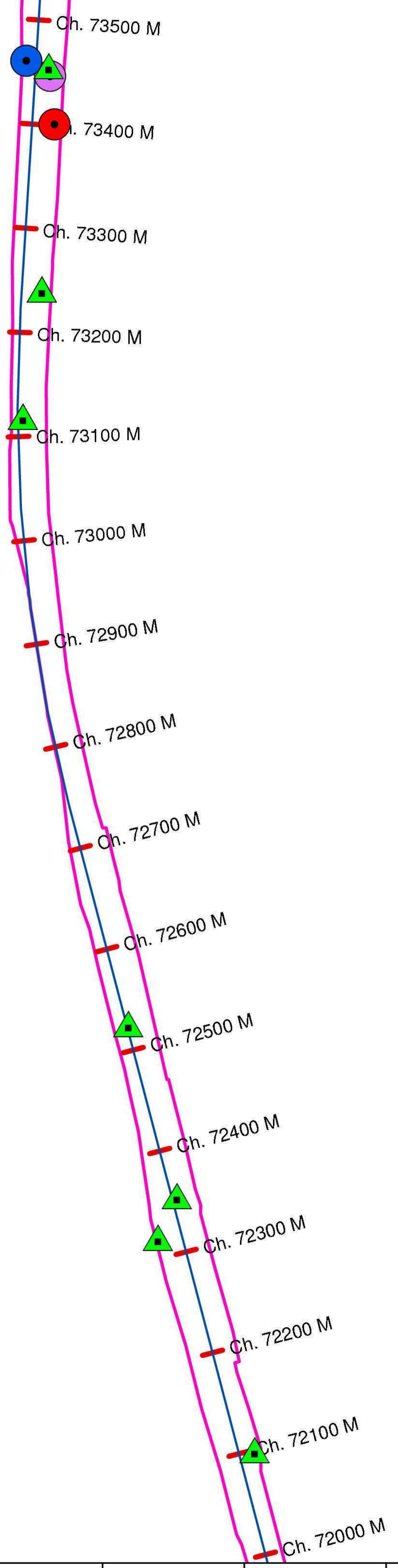
— PROPOSED ALIGNMENT
 BUFFER-ROW
- - - CHAINAGE LINE

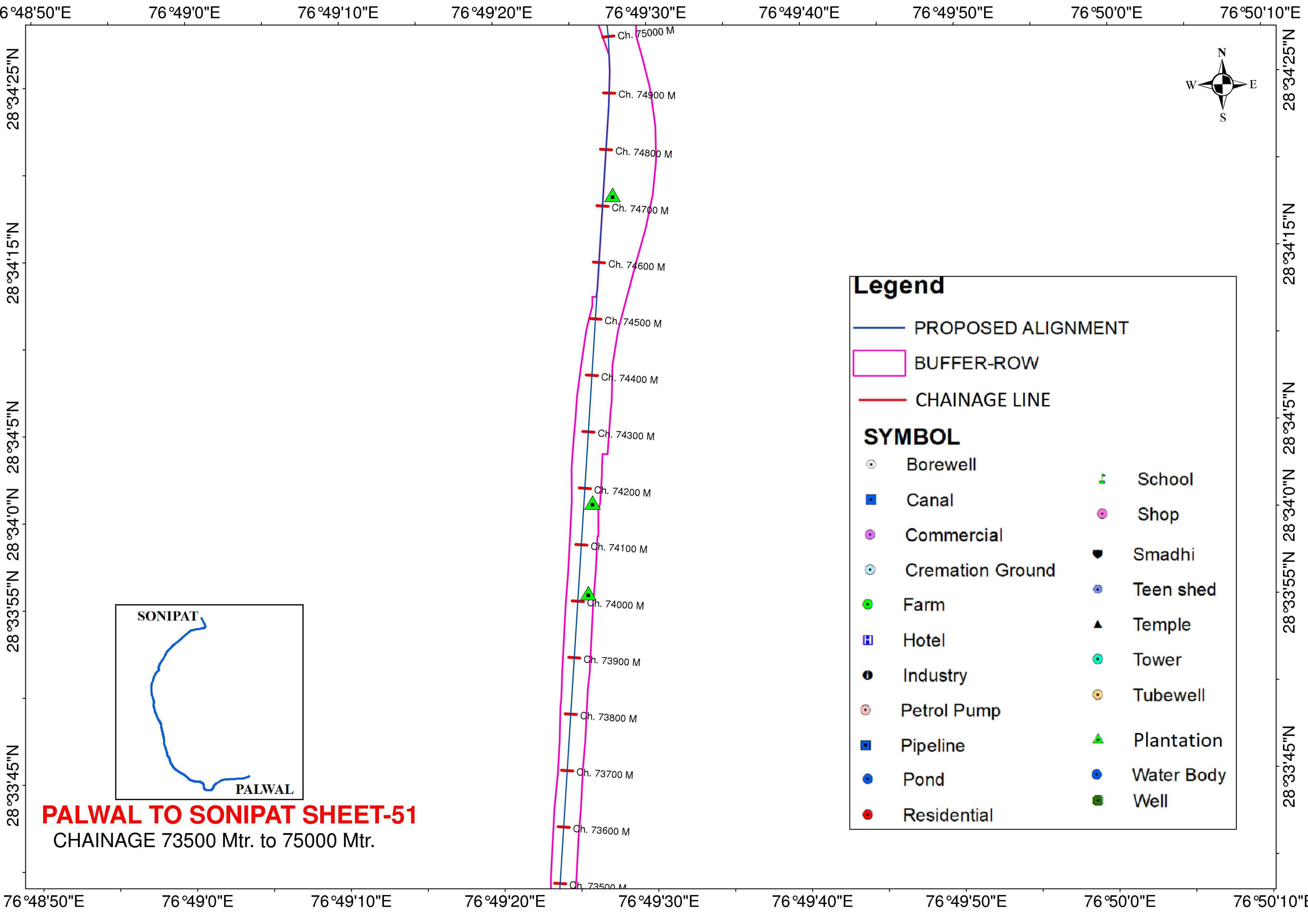
SYMBOL

⊙ Borewell	▲ School
■ Canal	⊙ Shop
⊙ Commercial	♣ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	⊙ Tubewell
⊙ Petrol Pump	▲ Plantation
■ Pipeline	⊙ Water Body
⊙ Pond	■ Well
● Residential	

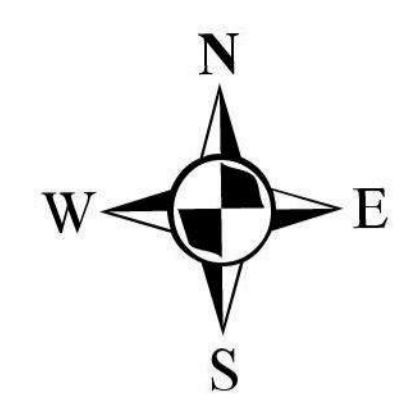
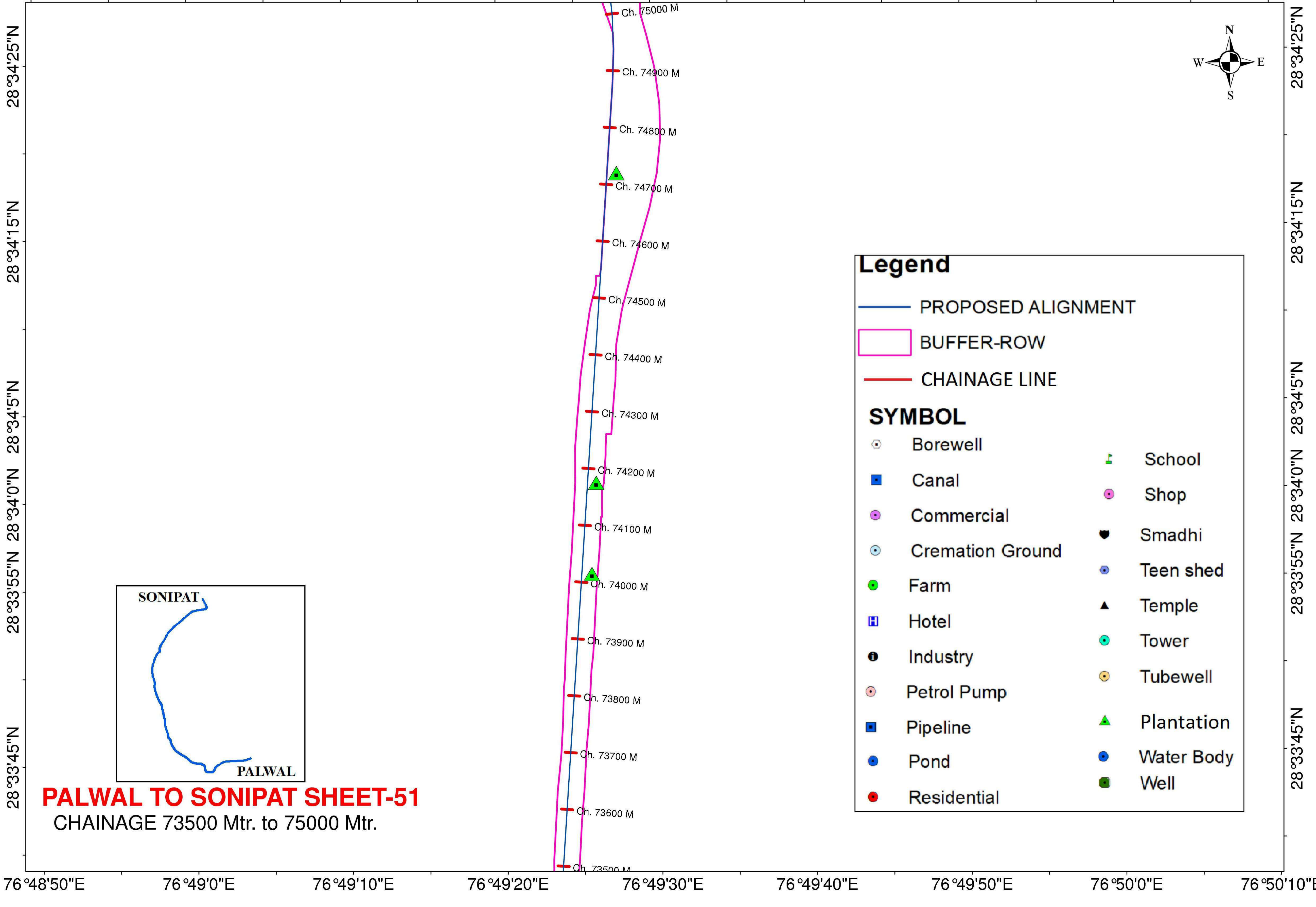


PALWAL TO SONIPAT SHEET-50
 CHAINAGE 72000 Mtr. to 73500 Mtr.





76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E 76°50'10"E

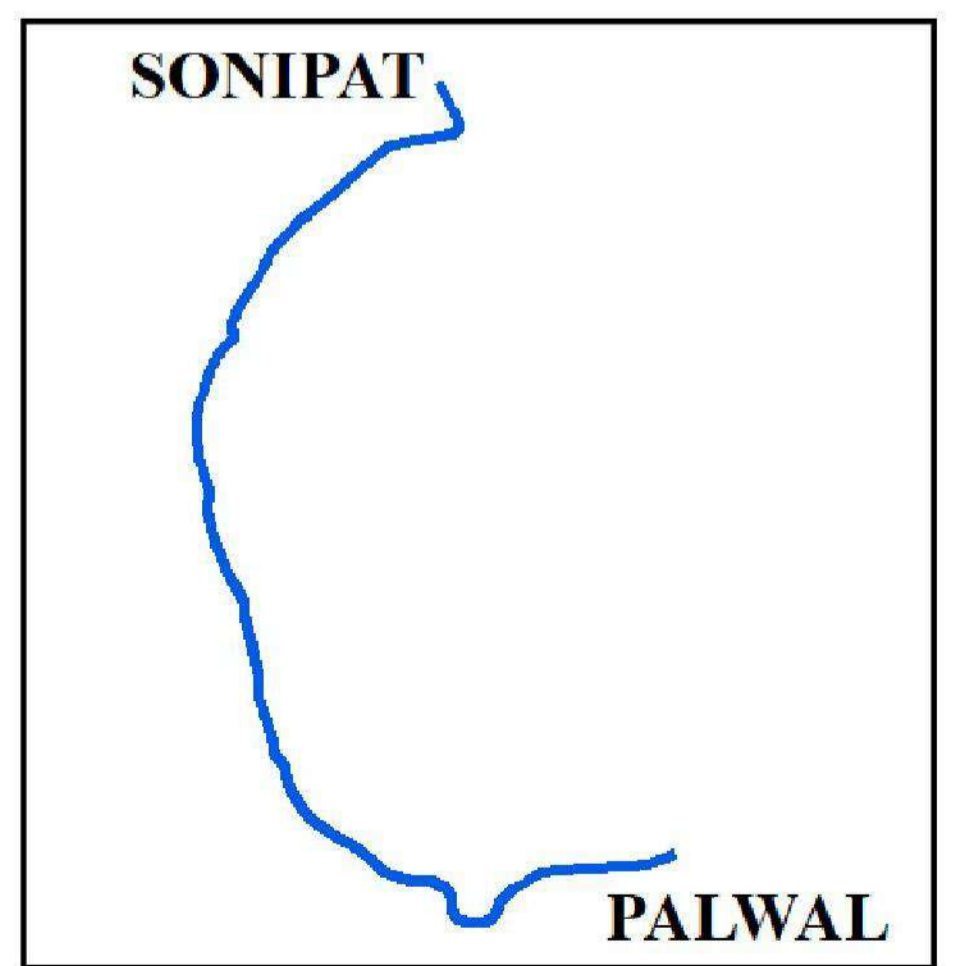


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	● Well
● Residential	

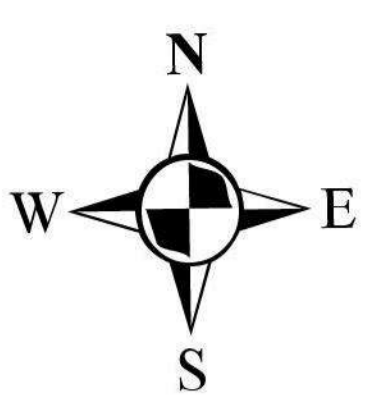
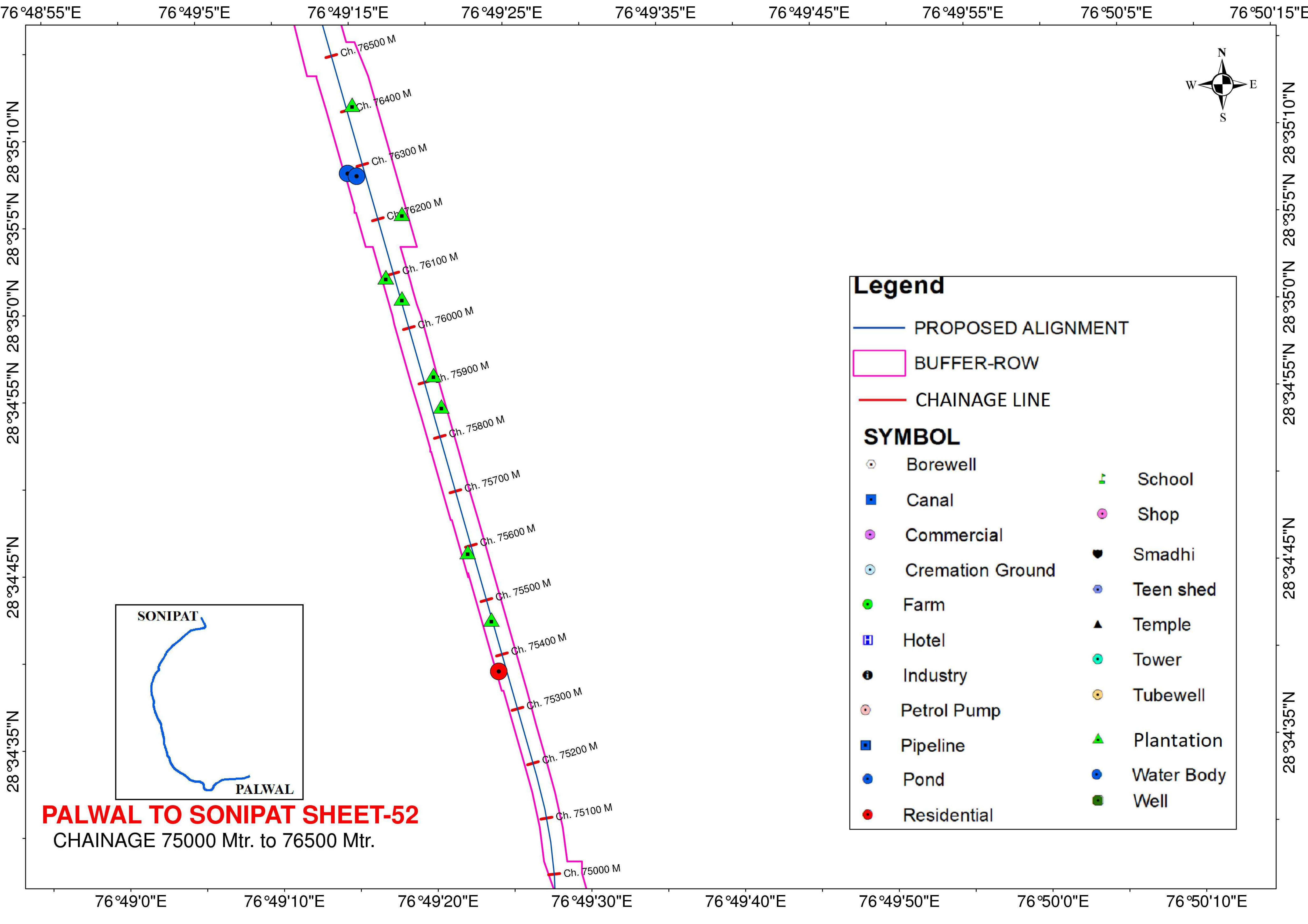


PALWAL TO SONIPAT SHEET-51
CHAINAGE 73500 Mtr. to 75000 Mtr.

76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E 76°50'10"E

28°33'45"N
28°33'55"N
28°34'0"N
28°34'5"N
28°34'15"N
28°34'25"N

28°33'45"N
28°33'55"N
28°34'0"N
28°34'5"N
28°34'15"N
28°34'25"N

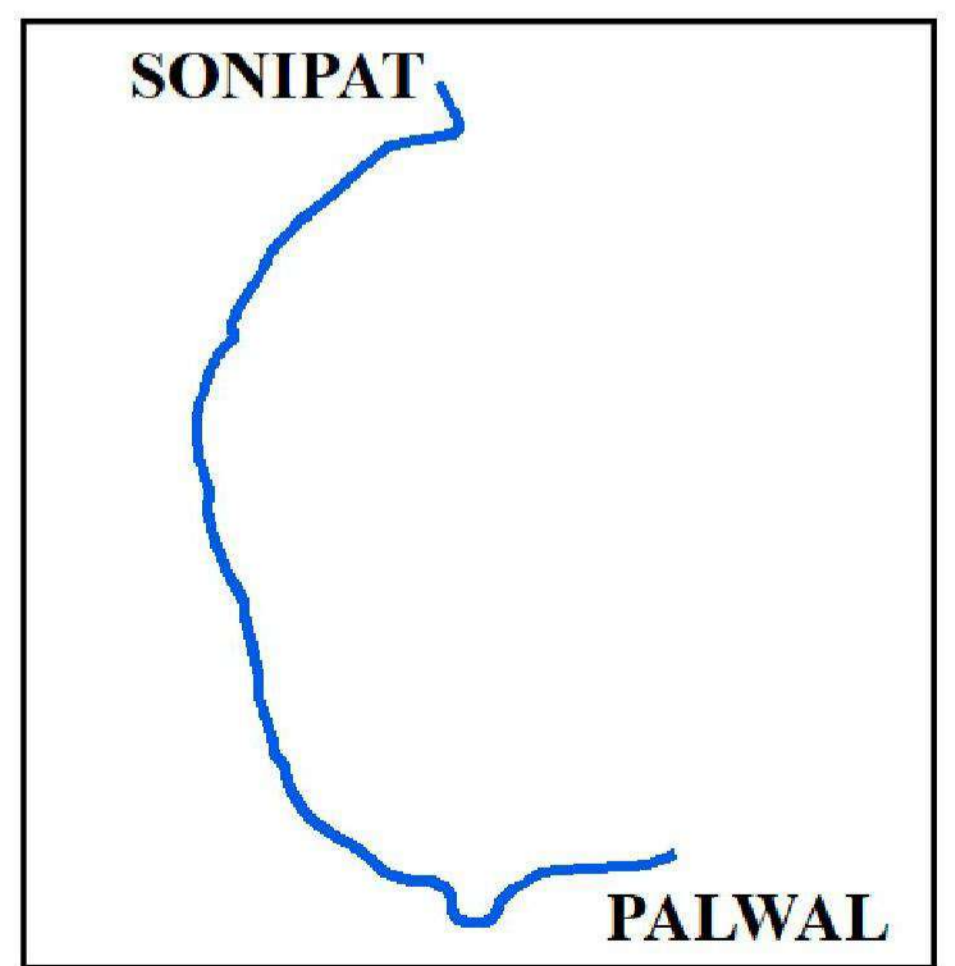


Legend

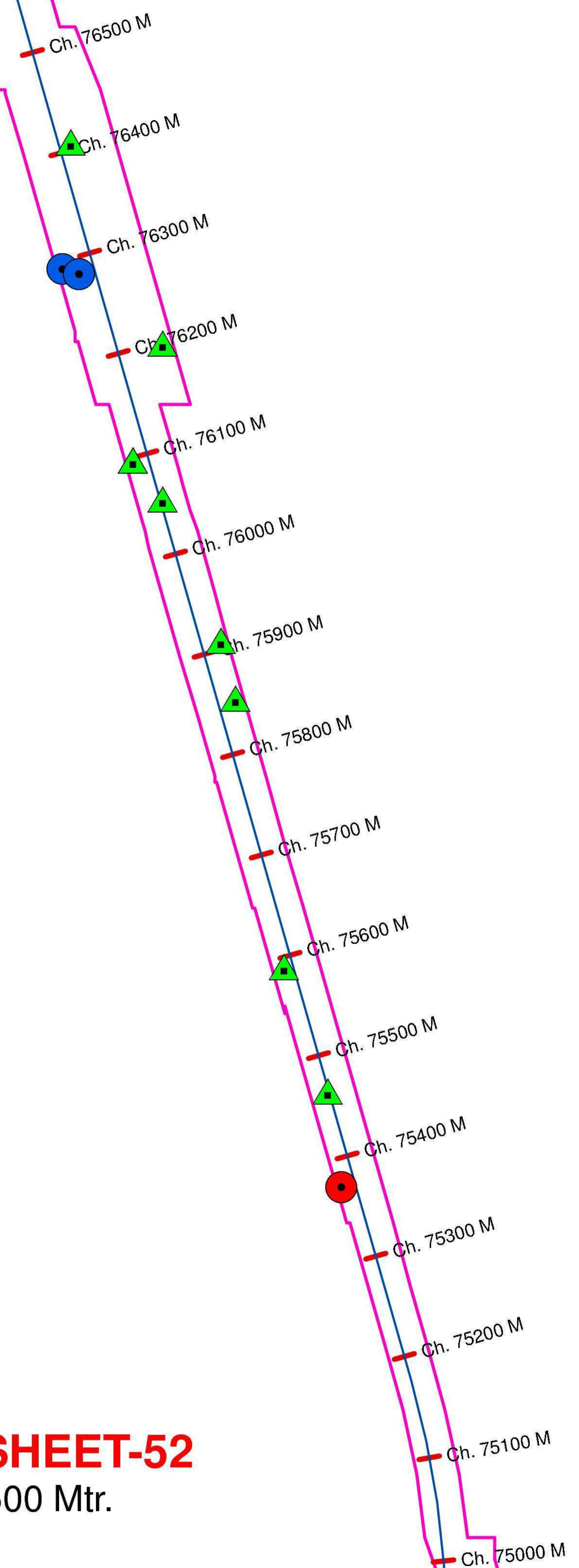
- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



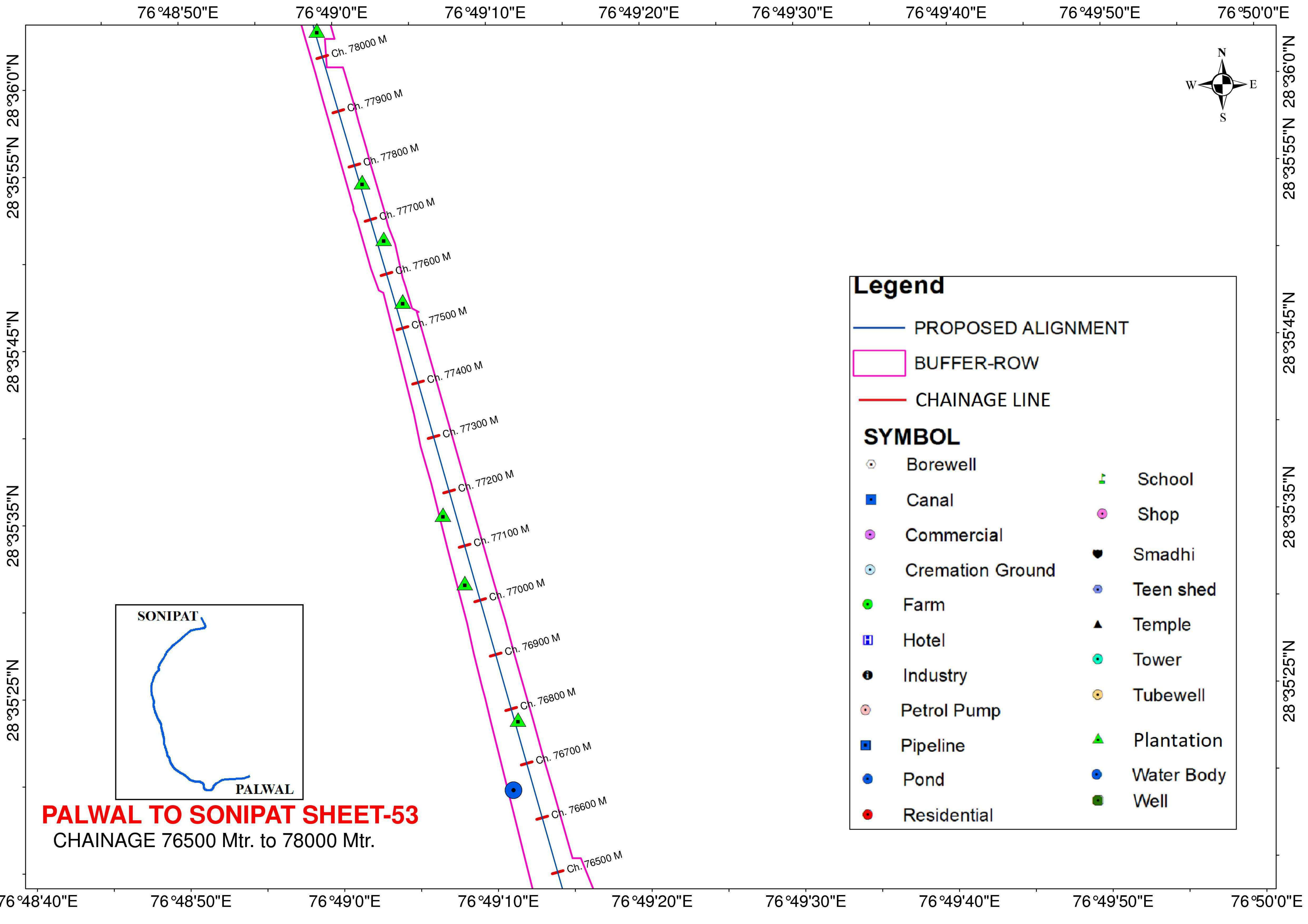
PALWAL TO SONIPAT SHEET-52
CHAINAGE 75000 Mtr. to 76500 Mtr.



76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E 76°50'10"E

28°34'35"N 28°34'45"N 28°34'55"N 28°35'0"N 28°35'5"N 28°35'10"N

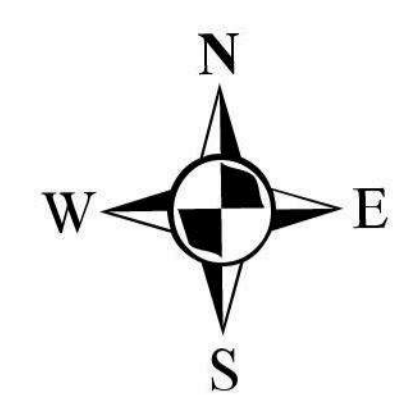
28°34'35"N 28°34'45"N 28°34'55"N 28°35'0"N 28°35'5"N 28°35'10"N



76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E

28°35'55"N 28°36'0"N
28°35'55"N 28°35'55"N
28°35'45"N
28°35'35"N
28°35'35"N
28°35'25"N
28°35'25"N

28°36'0"N
28°35'55"N
28°35'45"N
28°35'35"N
28°35'35"N
28°35'25"N
28°35'25"N

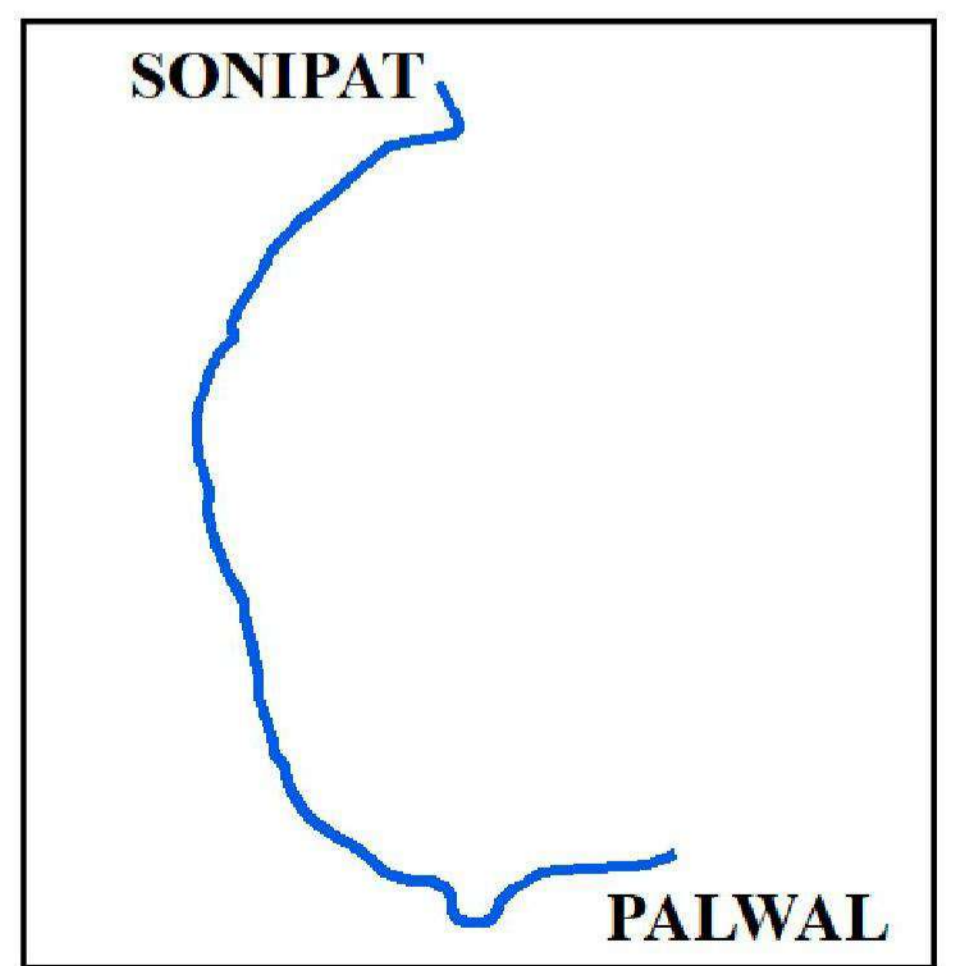


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

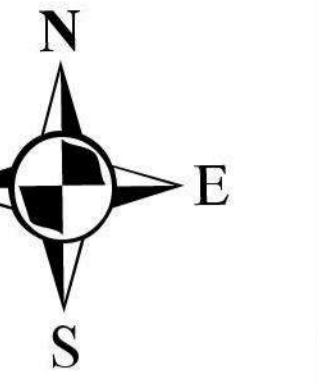
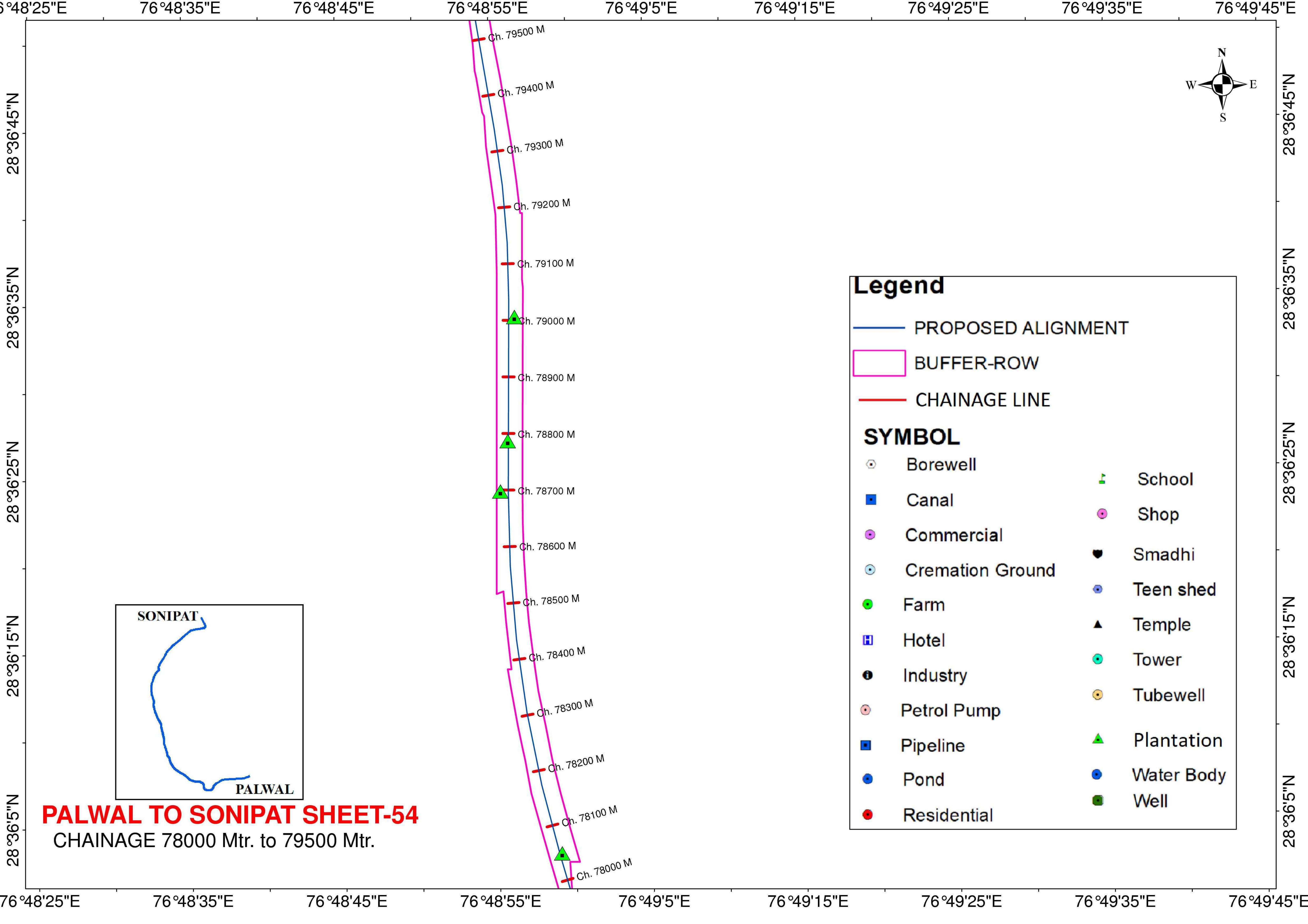
SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-53
CHAINAGE 76500 Mtr. to 78000 Mtr.

76°48'40"E 76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E

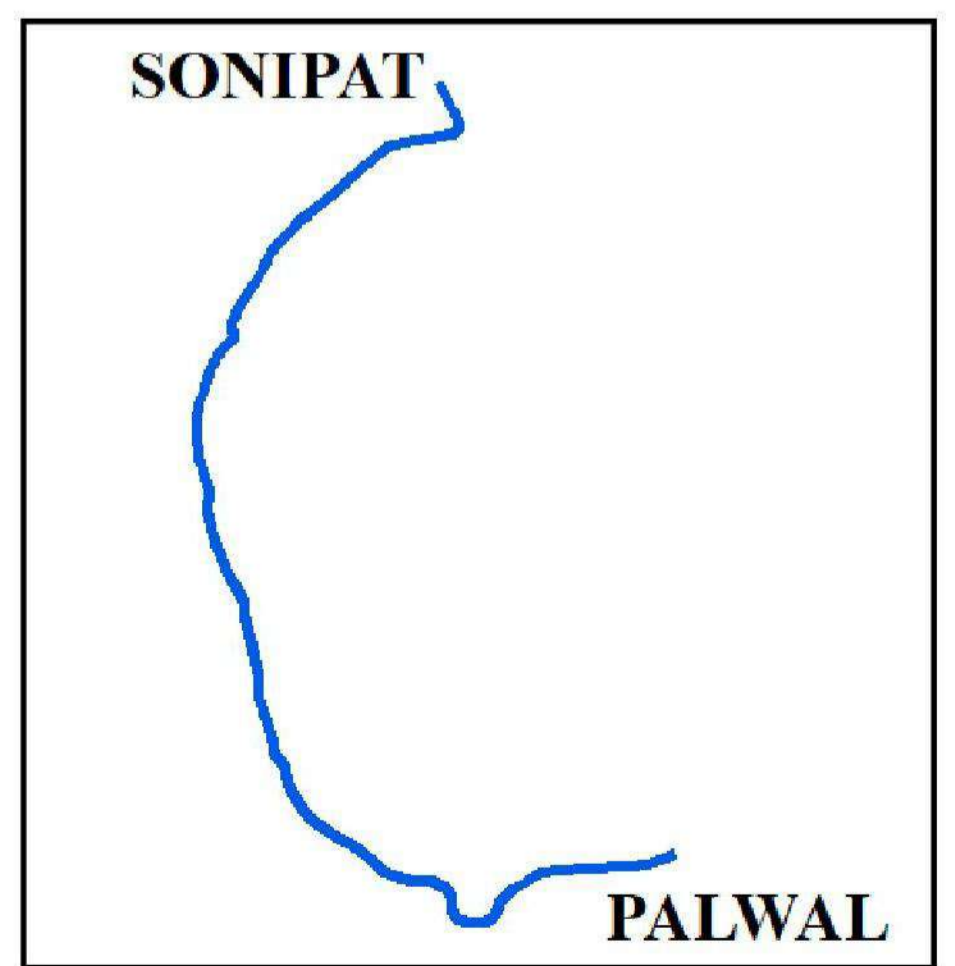


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

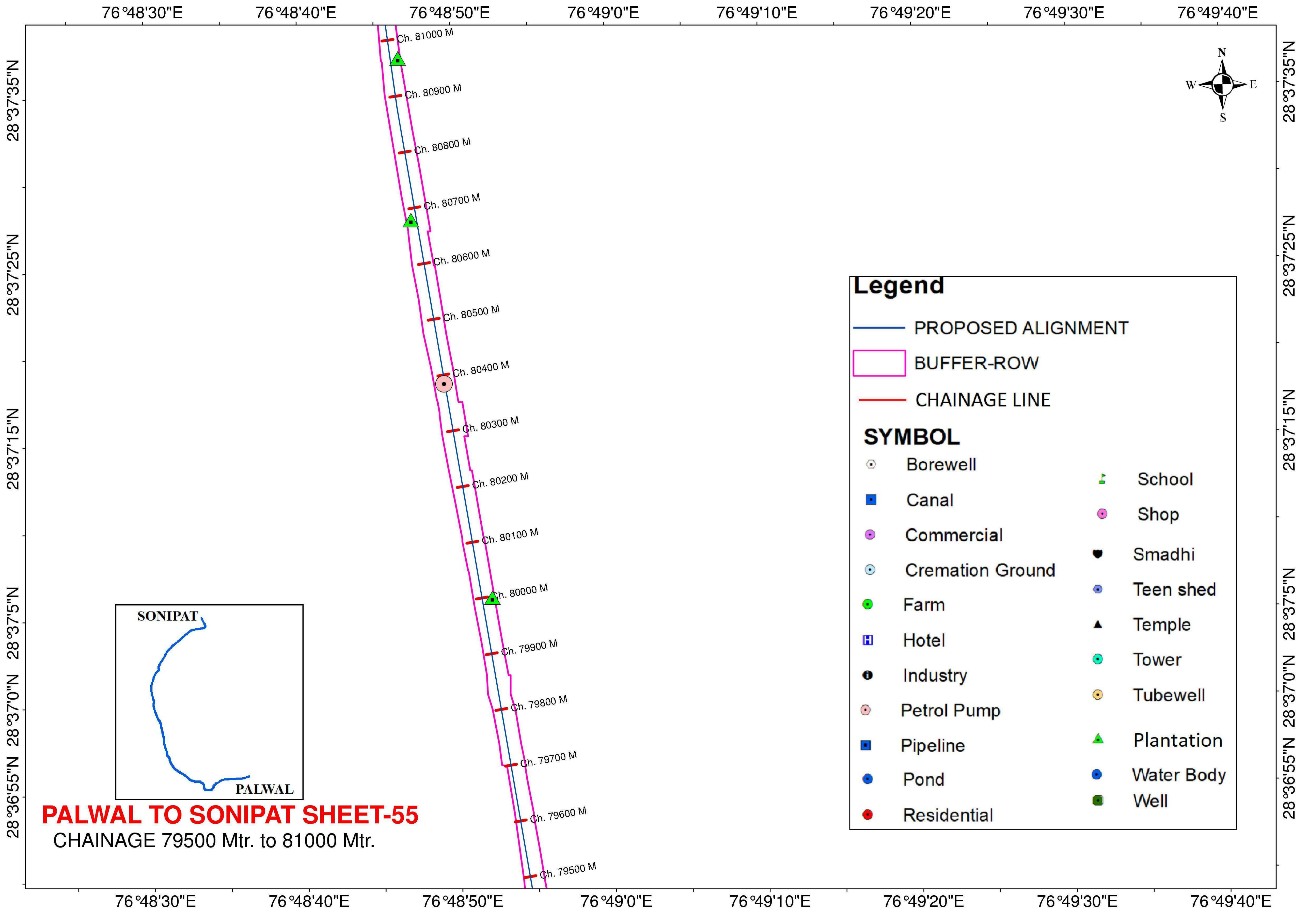
SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	● Well
● Residential	



PALWAL TO SONIPAT SHEET-54
 CHAINAGE 78000 Mtr. to 79500 Mtr.

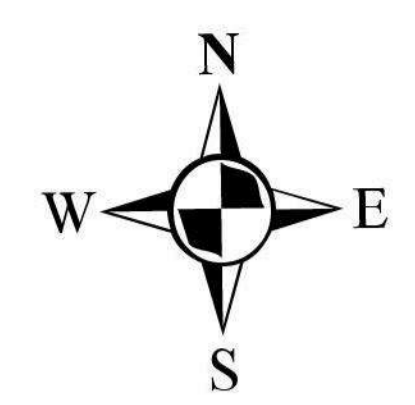
Ch. 79500 M
 Ch. 79400 M
 Ch. 79300 M
 Ch. 79200 M
 Ch. 79100 M
 Ch. 79000 M
 Ch. 78900 M
 Ch. 78800 M
 Ch. 78700 M
 Ch. 78600 M
 Ch. 78500 M
 Ch. 78400 M
 Ch. 78300 M
 Ch. 78200 M
 Ch. 78100 M
 Ch. 78000 M



76°48'30"E 76°48'40"E 76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E

28°37'35"N
28°37'25"N
28°37'15"N
28°37'5"N
28°37'0"N
28°36'55"N

28°37'35"N
28°37'25"N
28°37'15"N
28°37'5"N
28°37'0"N
28°36'55"N

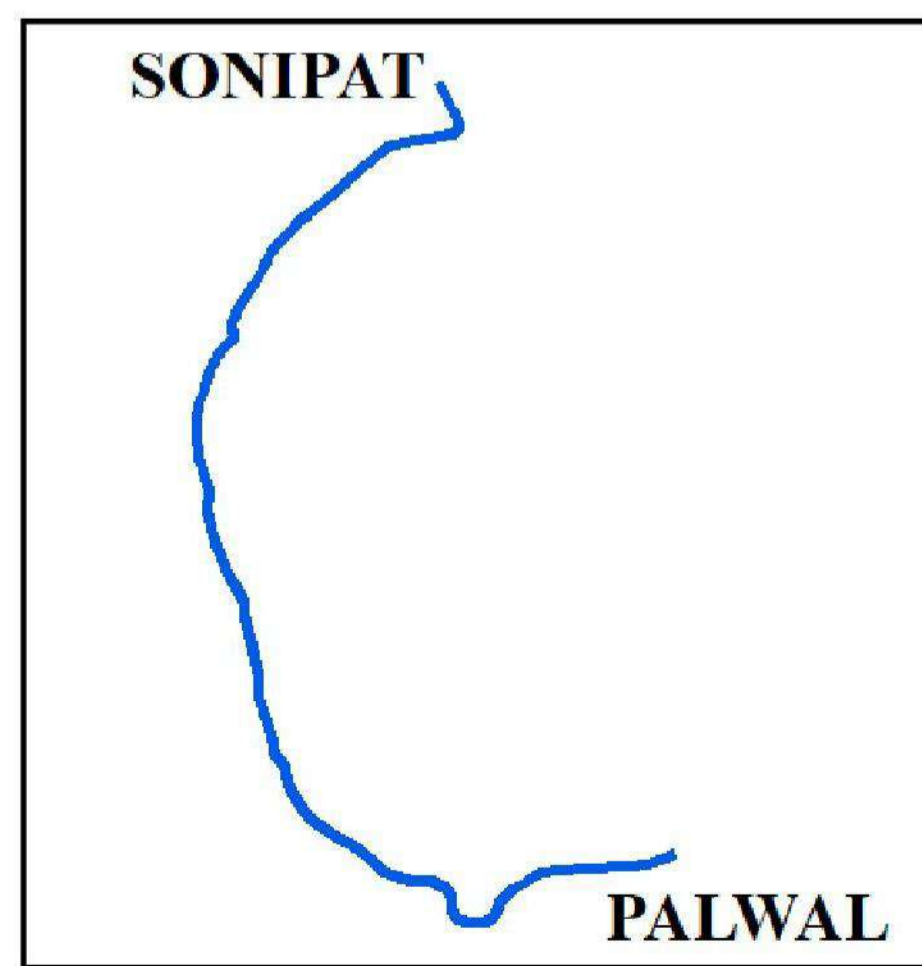


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

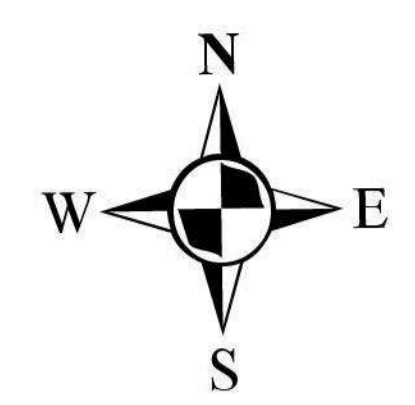
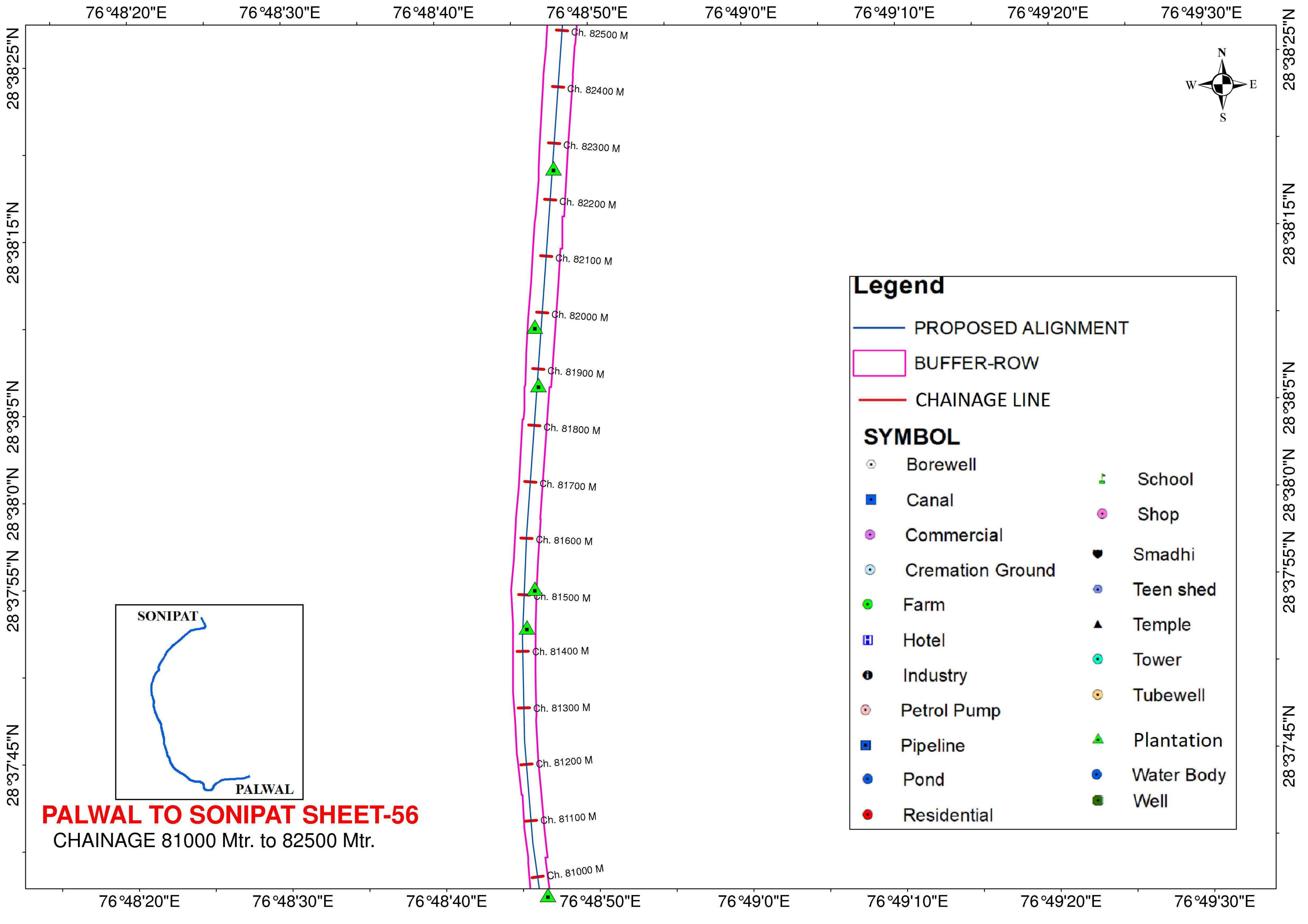
SYMBOL

○ Borewell	▲ School
■ Canal	○ Shop
○ Commercial	♣ Smadhi
○ Cremation Ground	○ Teen shed
● Farm	▲ Temple
H Hotel	● Tower
● Industry	○ Tubewell
○ Petrol Pump	▲ Plantation
■ Pipeline	○ Water Body
○ Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-55
CHAINAGE 79500 Mtr. to 81000 Mtr.

76°48'30"E 76°48'40"E 76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E

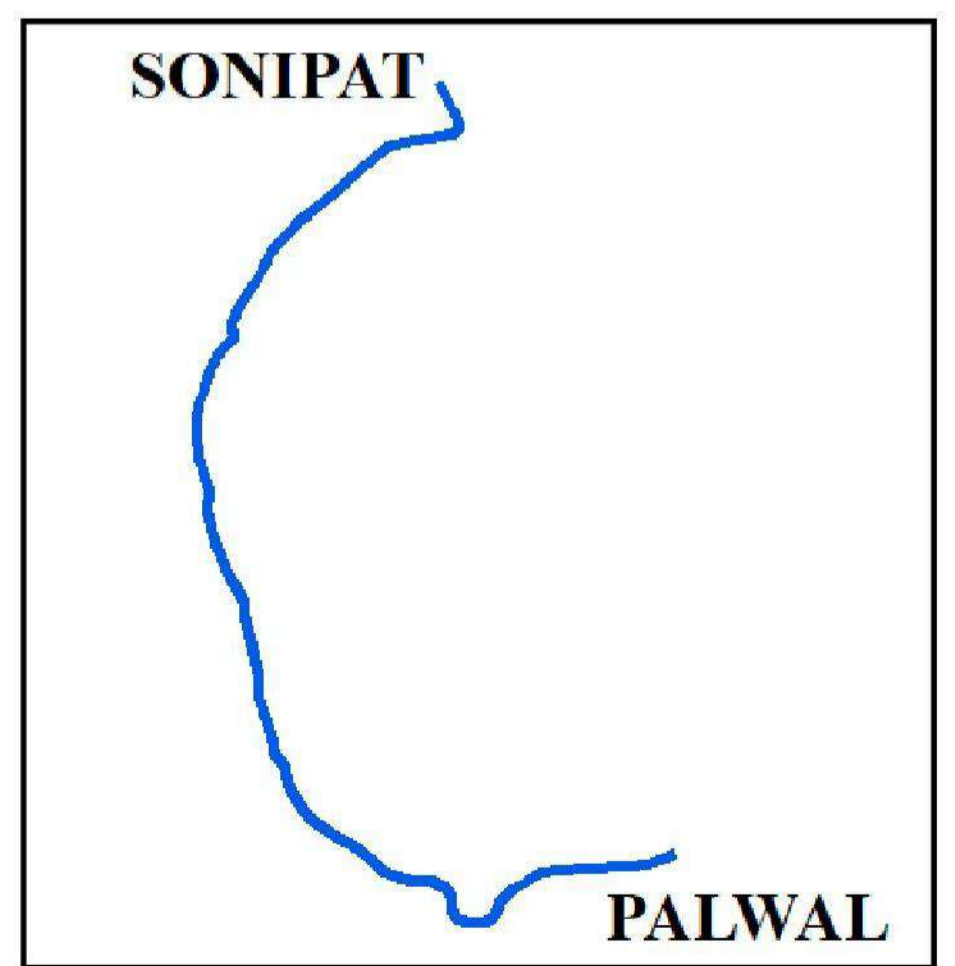


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	● Well
● Residential	



PALWAL TO SONIPAT SHEET-56
 CHAINAGE 81000 Mtr. to 82500 Mtr.

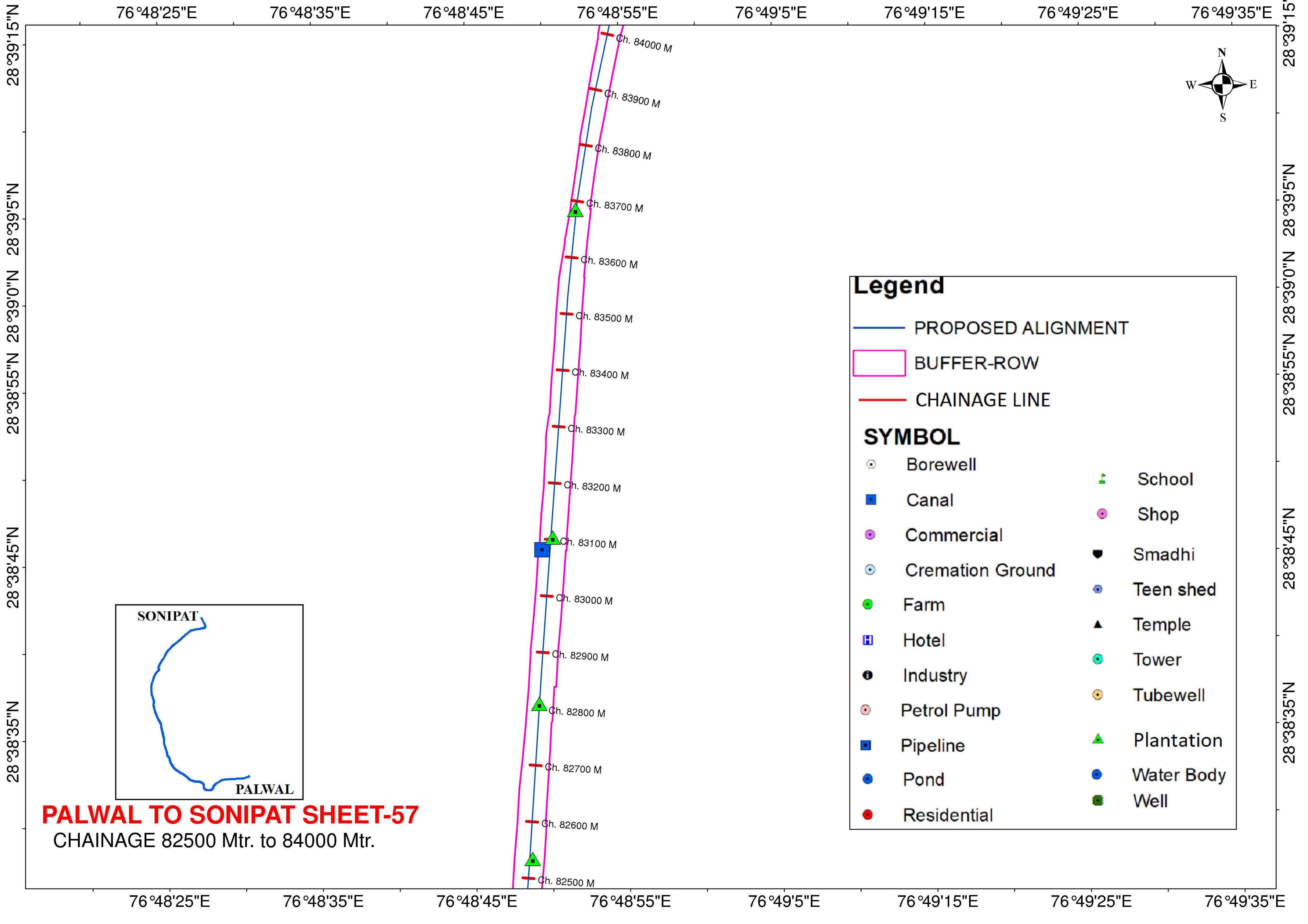
Ch. 82500 M
 Ch. 82400 M
 Ch. 82300 M
 Ch. 82200 M
 Ch. 82100 M
 Ch. 82000 M
 Ch. 81900 M
 Ch. 81800 M
 Ch. 81700 M
 Ch. 81600 M
 Ch. 81500 M
 Ch. 81400 M
 Ch. 81300 M
 Ch. 81200 M
 Ch. 81100 M
 Ch. 81000 M

76°48'20"E 76°48'30"E 76°48'40"E 76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E

28°37'45"N 28°37'55"N 28°38'0"N 28°38'5"N 28°38'15"N 28°38'25"N

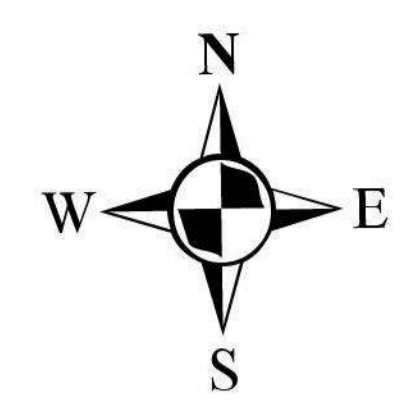
28°37'45"N 28°37'55"N 28°38'0"N 28°38'5"N 28°38'15"N 28°38'25"N

76°48'20"E 76°48'30"E 76°48'40"E 76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E



76°48'25"E 76°48'35"E 76°48'45"E 76°48'55"E 76°49'5"E 76°49'15"E 76°49'25"E 76°49'35"E

28°39'15"N
28°39'15"N
28°39'15"N
28°39'0"N
28°39'0"N
28°38'55"N
28°38'55"N
28°38'45"N
28°38'45"N
28°38'35"N
28°38'35"N

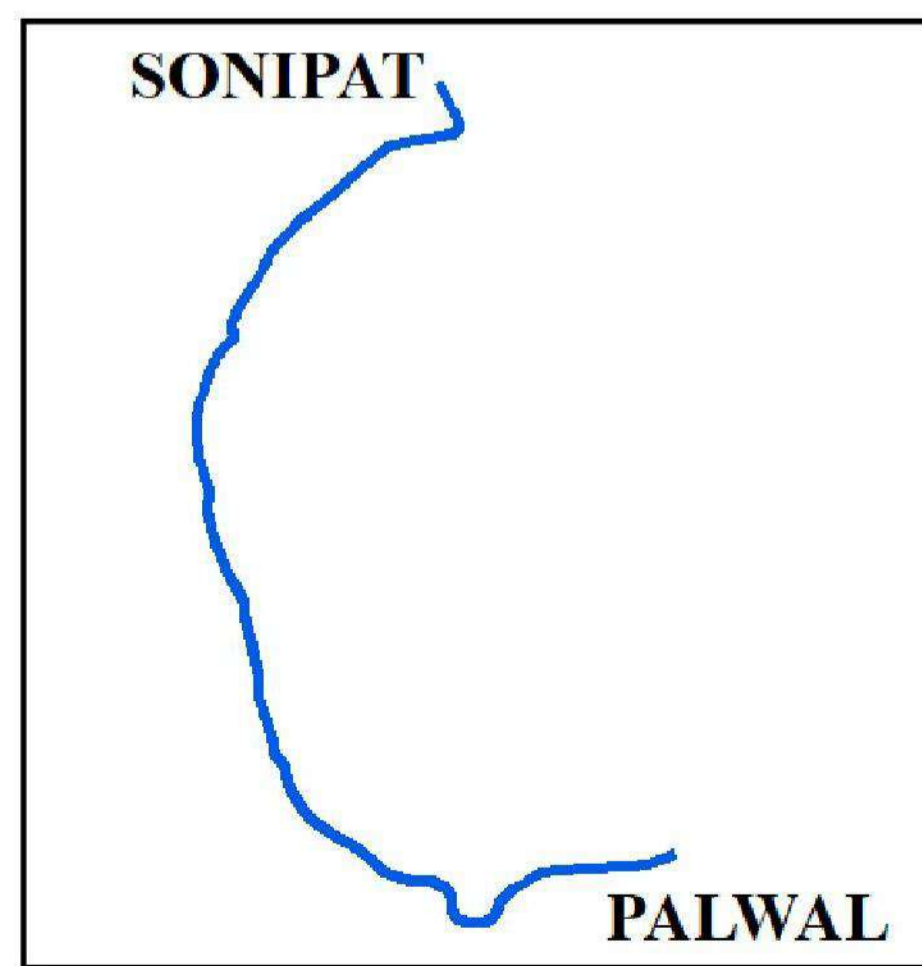


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	● Well
● Residential	

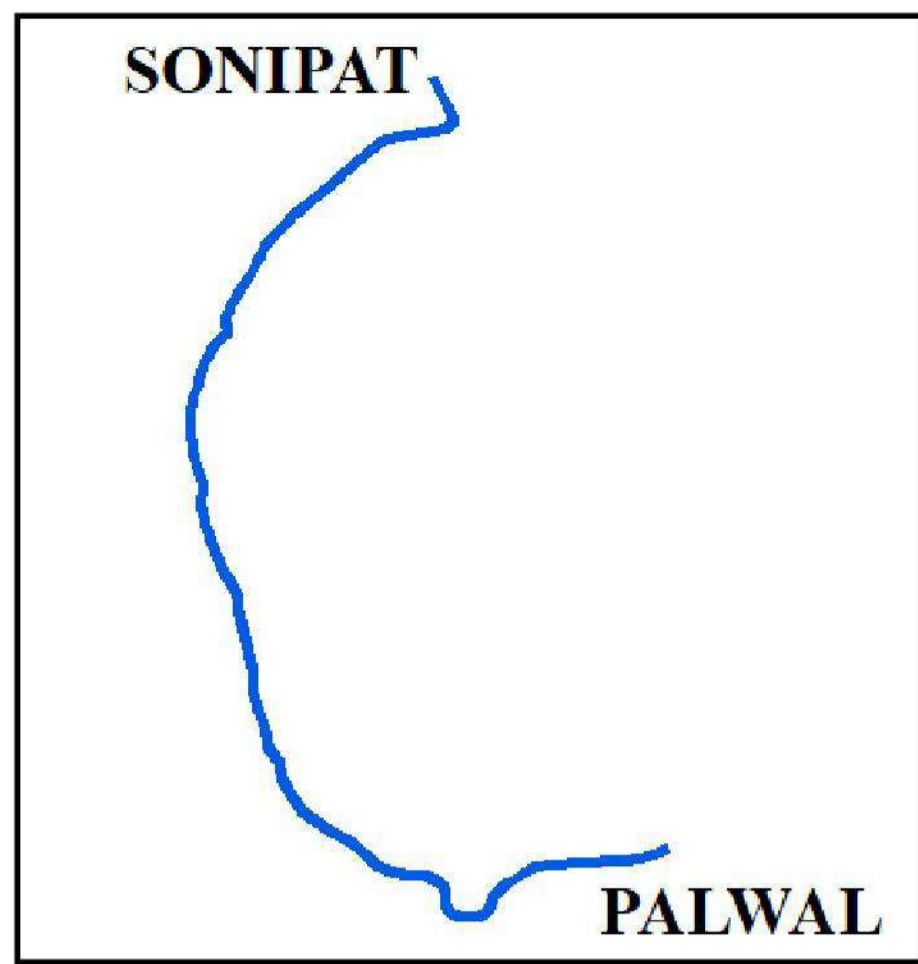


PALWAL TO SONIPAT SHEET-57
CHAINAGE 82500 Mtr. to 84000 Mtr.

76°48'25"E 76°48'35"E 76°48'45"E 76°48'55"E 76°49'5"E 76°49'15"E 76°49'25"E 76°49'35"E

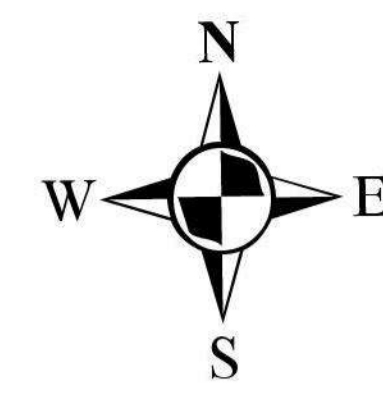
Ch. 84000 M
Ch. 83900 M
Ch. 83800 M
Ch. 83700 M
Ch. 83600 M
Ch. 83500 M
Ch. 83400 M
Ch. 83300 M
Ch. 83200 M
Ch. 83100 M
Ch. 83000 M
Ch. 82900 M
Ch. 82800 M
Ch. 82700 M
Ch. 82600 M
Ch. 82500 M

76°48'30"E 76°48'40"E 76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E

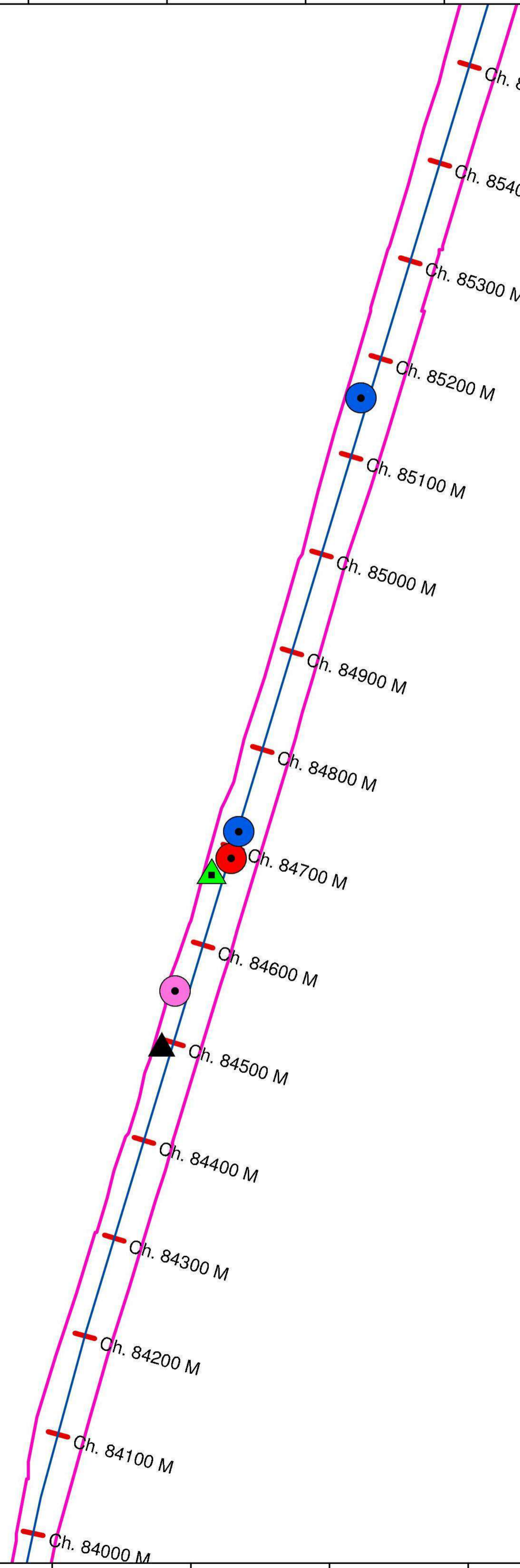


PALWAL TO SONIPAT SHEET-58

CHAINAGE 84000 Mtr. to 85500 Mtr.



28°39'15"N
28°39'25"N
28°39'35"N
28°39'45"N
28°39'55"N
28°40'0"N



Legend

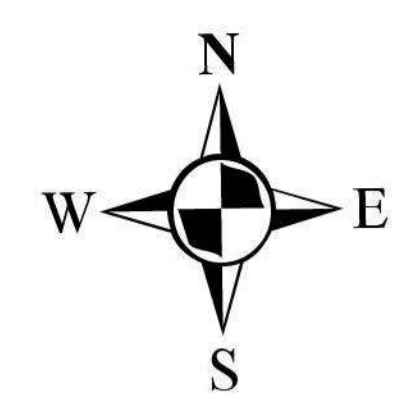
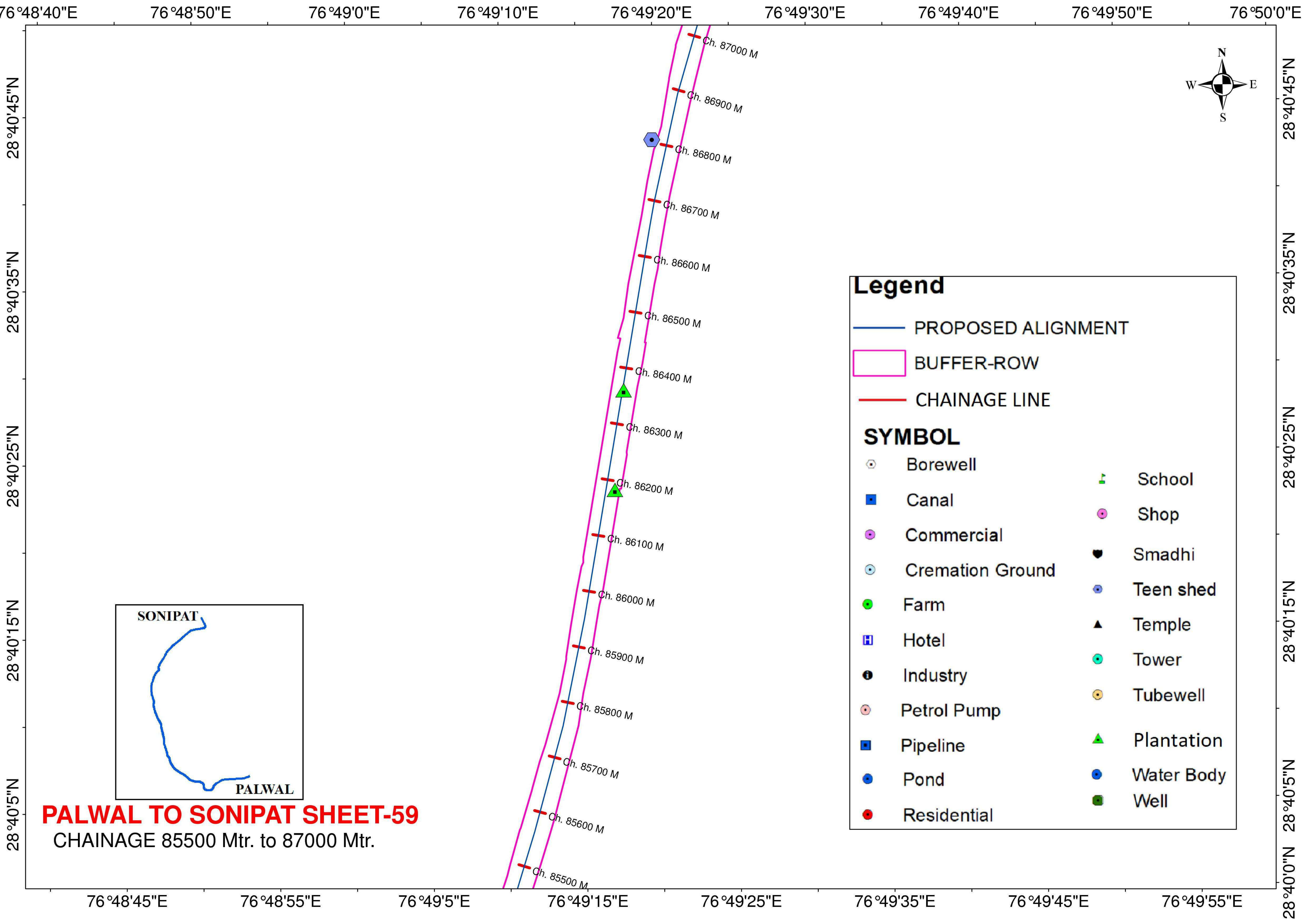
- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

⊙ Borewell	🏫 School
■ Canal	● Shop
● Commercial	☠ Smadhi
⊙ Cremation Ground	🏠 Teen shed
● Farm	▲ Temple
🏨 Hotel	🗼 Tower
🏭 Industry	🕯 Tubewell
⊙ Petrol Pump	🌳 Plantation
■ Pipeline	🌊 Water Body
● Pond	● Well
● Residential	

76°48'30"E 76°48'40"E 76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E

28°39'15"N
28°39'25"N
28°39'35"N
28°39'45"N
28°39'55"N
28°40'0"N

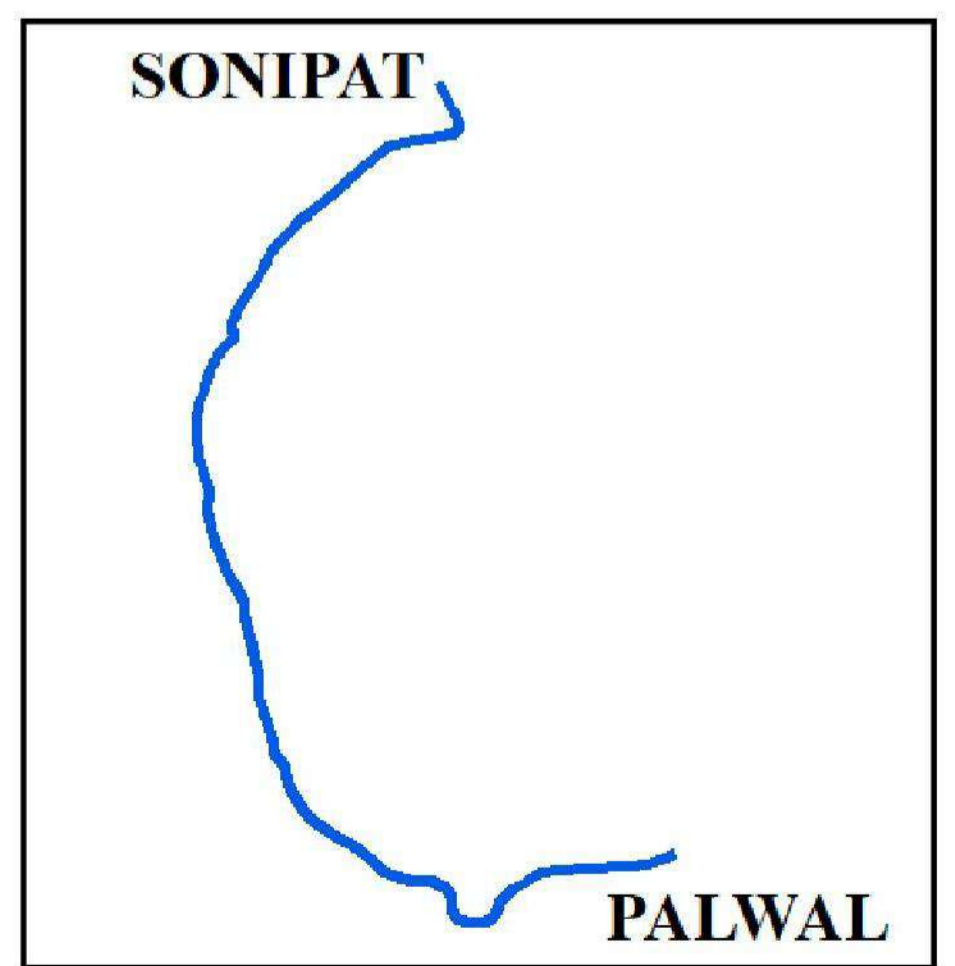


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	⊙ Shop
⊙ Commercial	♣ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	⊙ Tubewell
⊙ Petrol Pump	▲ Plantation
■ Pipeline	⊙ Water Body
⊙ Pond	■ Well
● Residential	



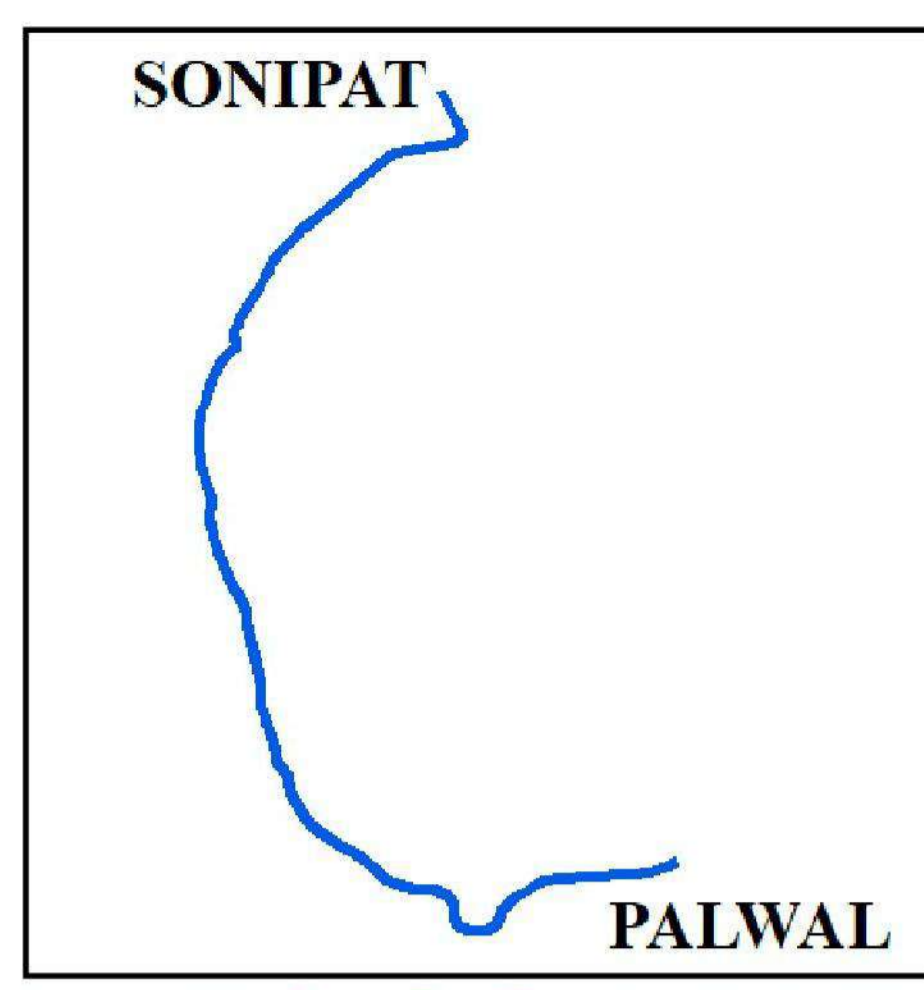
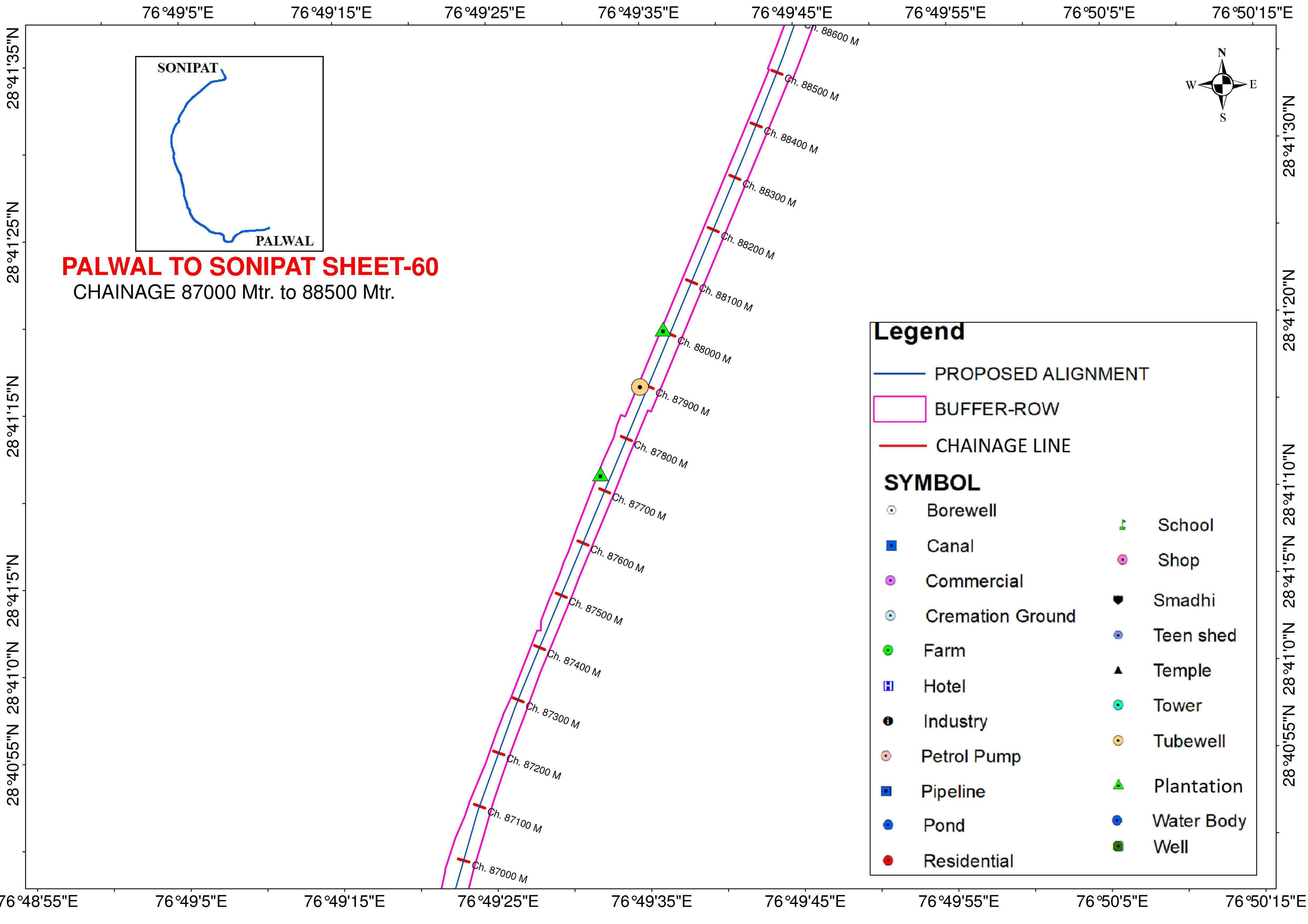
PALWAL TO SONIPAT SHEET-59
 CHAINAGE 85500 Mtr. to 87000 Mtr.

76°48'40"E 76°48'50"E 76°49'0"E 76°49'10"E 76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E

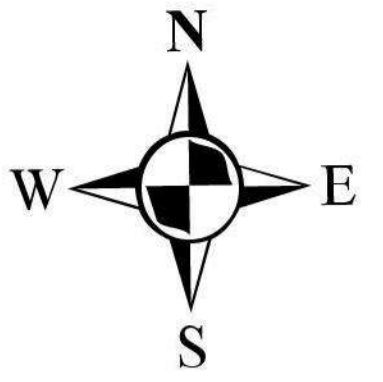
28°40'45"N 28°40'35"N 28°40'25"N 28°40'15"N 28°40'5"N

76°48'45"E 76°48'55"E 76°49'5"E 76°49'15"E 76°49'25"E 76°49'35"E 76°49'45"E 76°49'55"E

28°40'0"N 28°40'5"N



PALWAL TO SONIPAT SHEET-60
CHAINAGE 87000 Mtr. to 88500 Mtr.

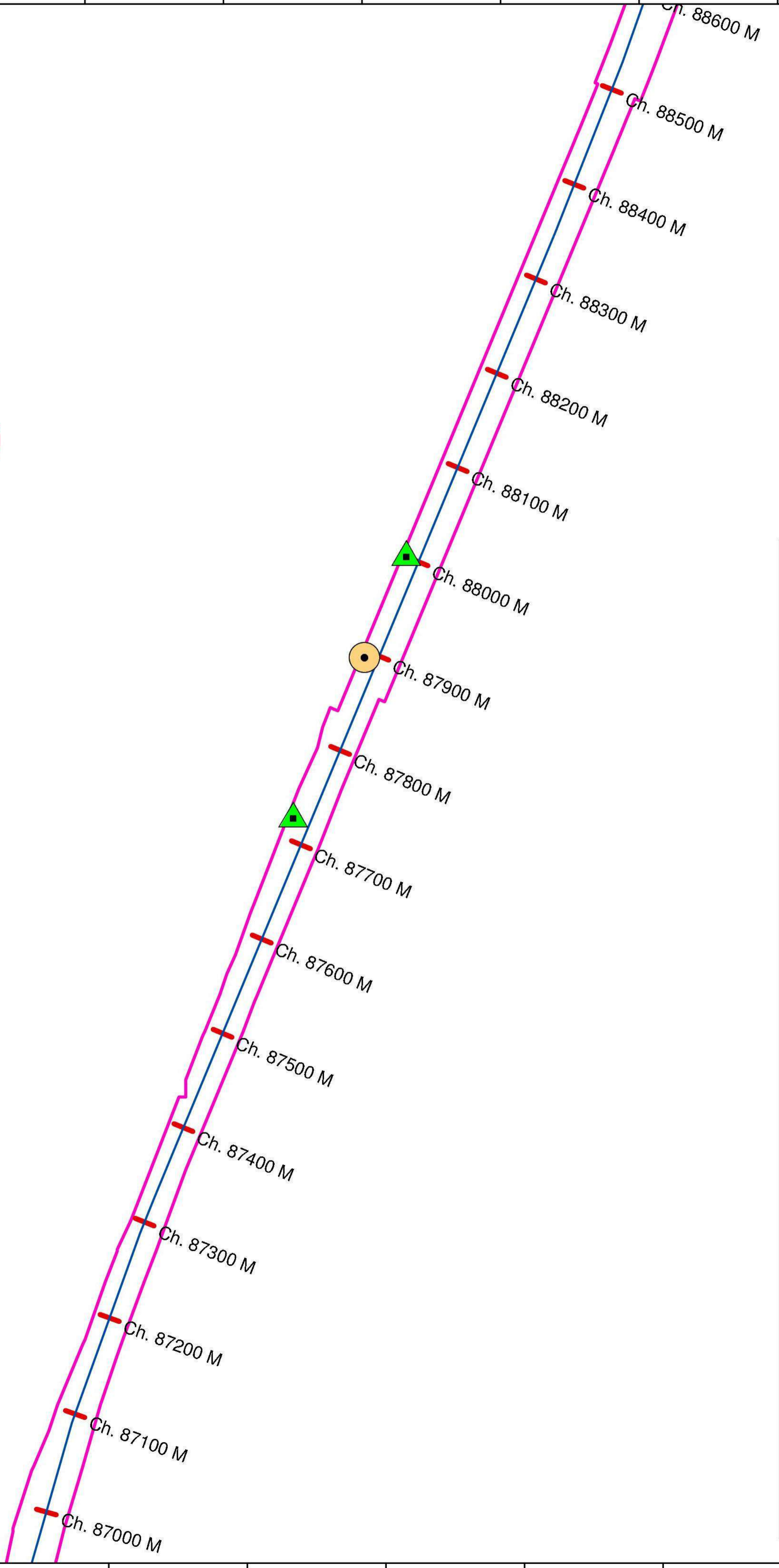


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

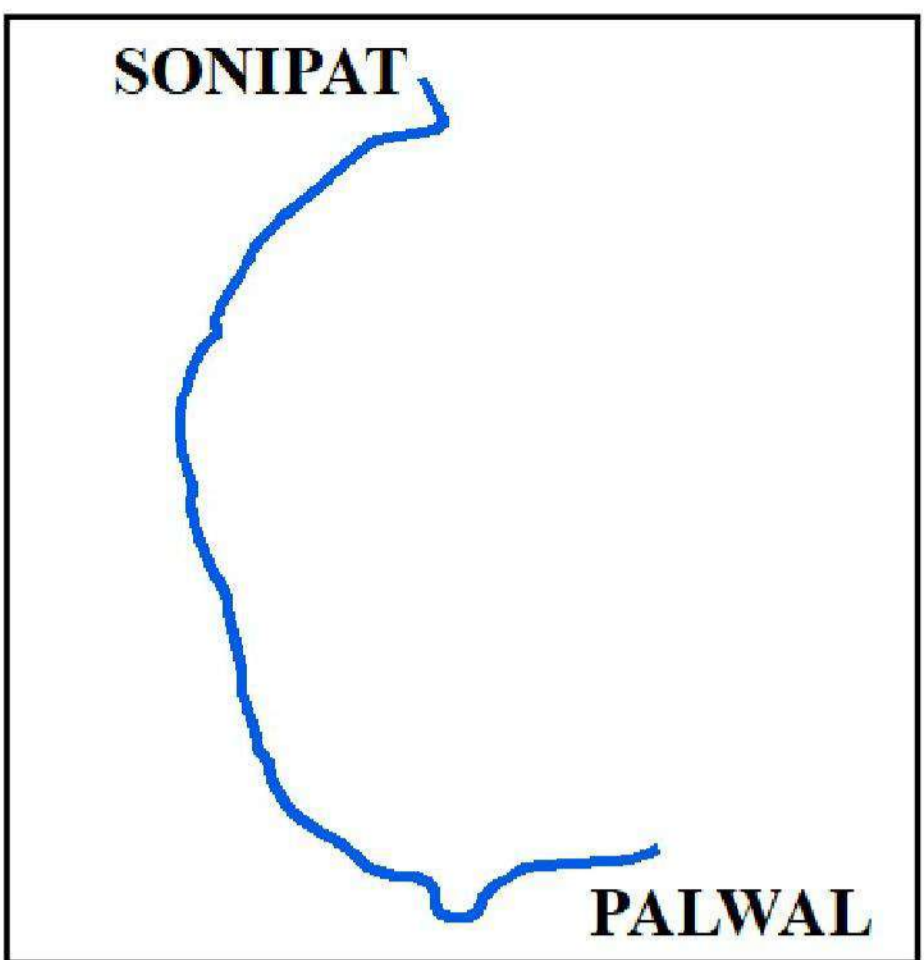
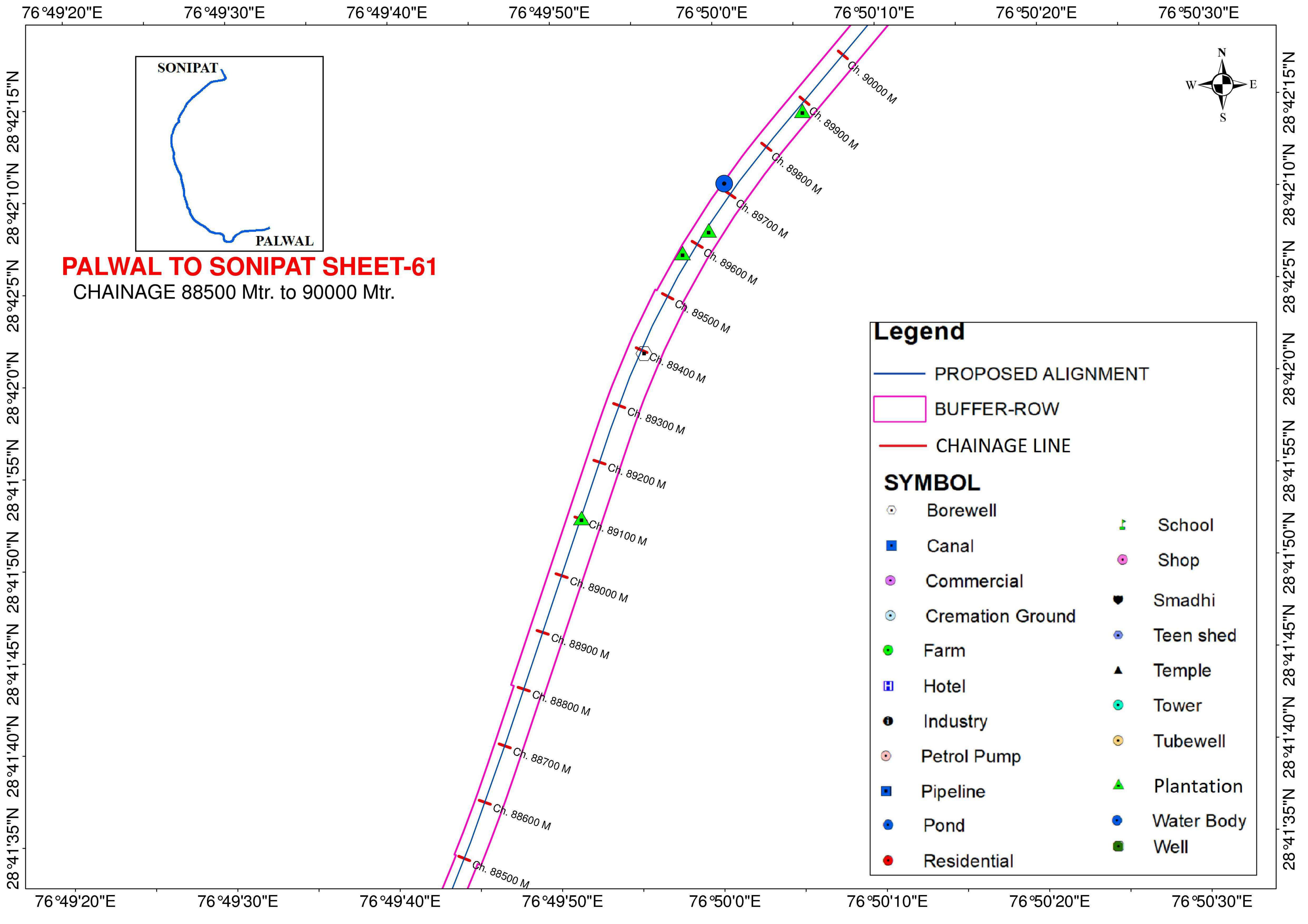
SYMBOL

○ Borewell	▲ School
■ Canal	○ Shop
○ Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
⊠ Hotel	● Tower
ⓘ Industry	● Tubewell
○ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	● Well
● Residential	

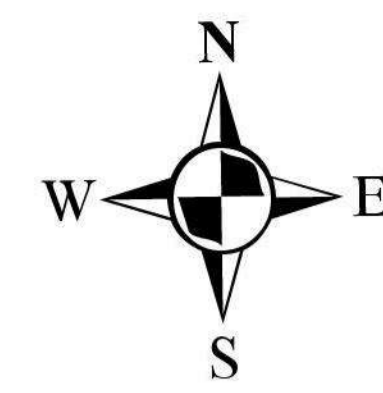


76°48'55"E 76°49'5"E 76°49'15"E 76°49'25"E 76°49'35"E 76°49'45"E 76°49'55"E 76°50'5"E 76°50'15"E

28°40'55"N 28°41'0"N 28°41'5"N 28°41'15"N 28°41'25"N 28°41'35"N



PALWAL TO SONIPAT SHEET-61
CHAINAGE 88500 Mtr. to 90000 Mtr.



Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

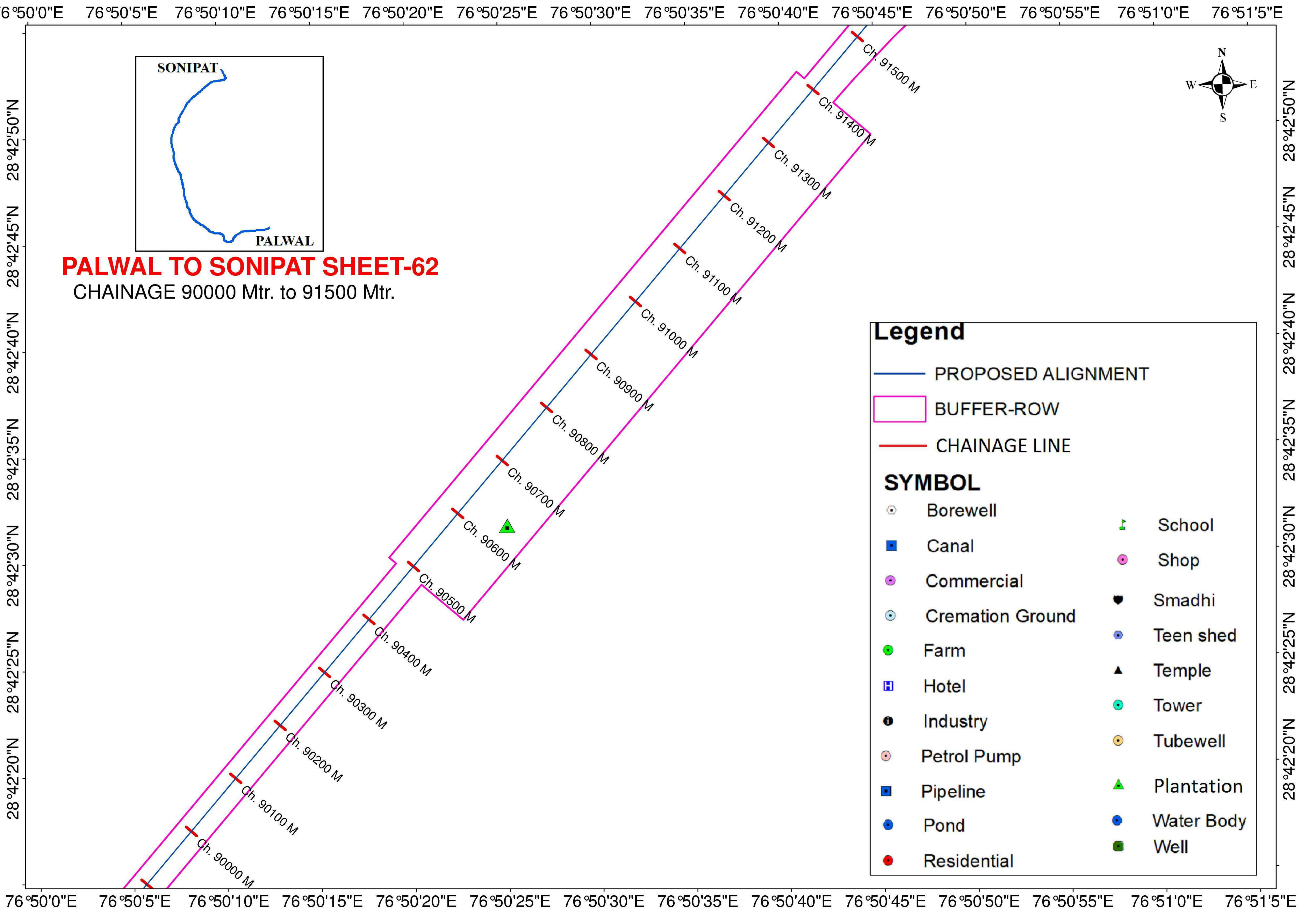
SYMBOL

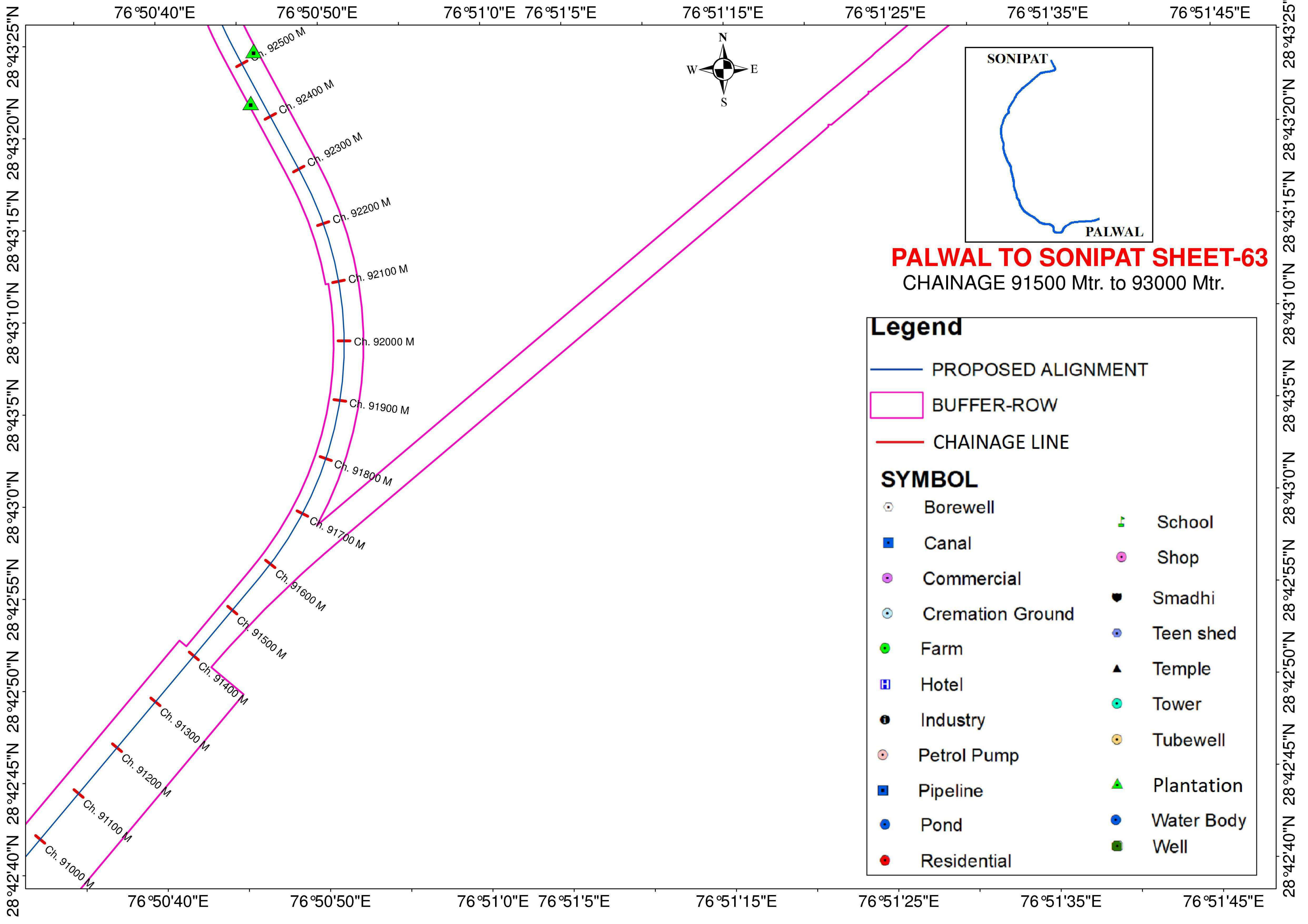
○ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	● Well
● Residential	

76°49'20"E 76°49'30"E 76°49'40"E 76°49'50"E 76°50'0"E 76°50'10"E 76°50'20"E 76°50'30"E

28°41'35"N 28°41'40"N 28°41'45"N 28°41'50"N 28°41'55"N 28°42'0"N 28°42'5"N 28°42'10"N 28°42'15"N

Ch. 88500 M
Ch. 88600 M
Ch. 88700 M
Ch. 88800 M
Ch. 88900 M
Ch. 88900 M
Ch. 88900 M
Ch. 88900 M
Ch. 89000 M
Ch. 89100 M
Ch. 89200 M
Ch. 89300 M
Ch. 89400 M
Ch. 89500 M
Ch. 89600 M
Ch. 89700 M
Ch. 89800 M
Ch. 89900 M
Ch. 90000 M





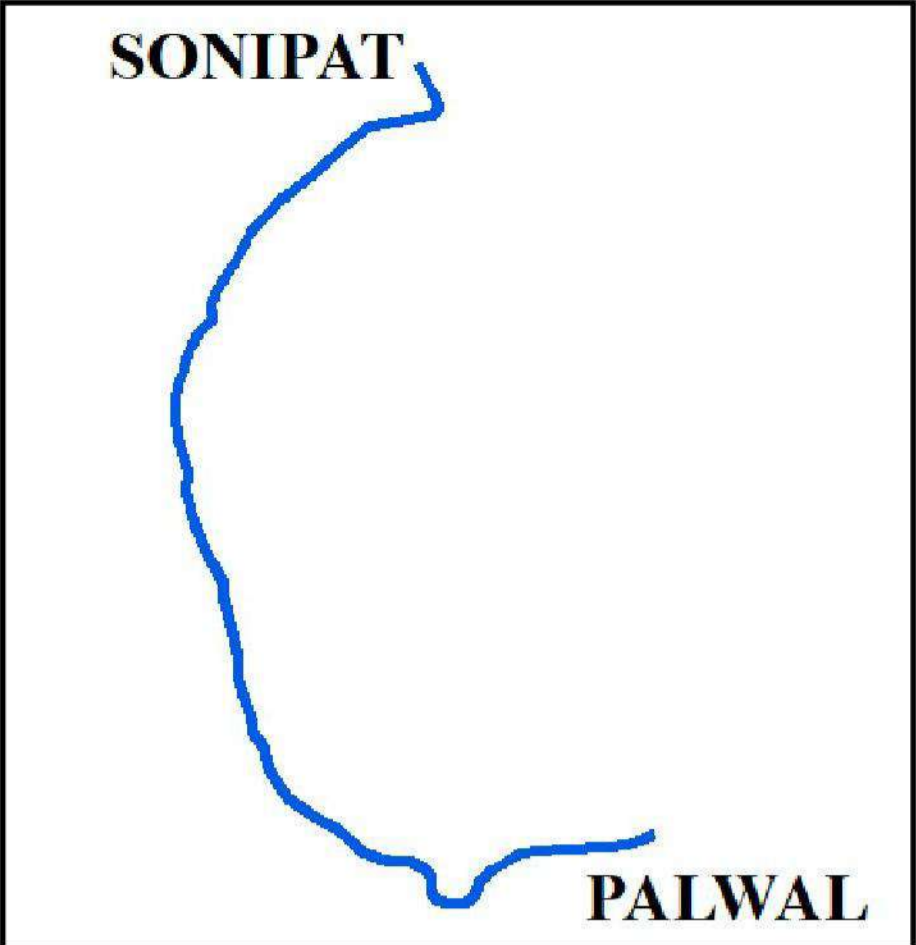
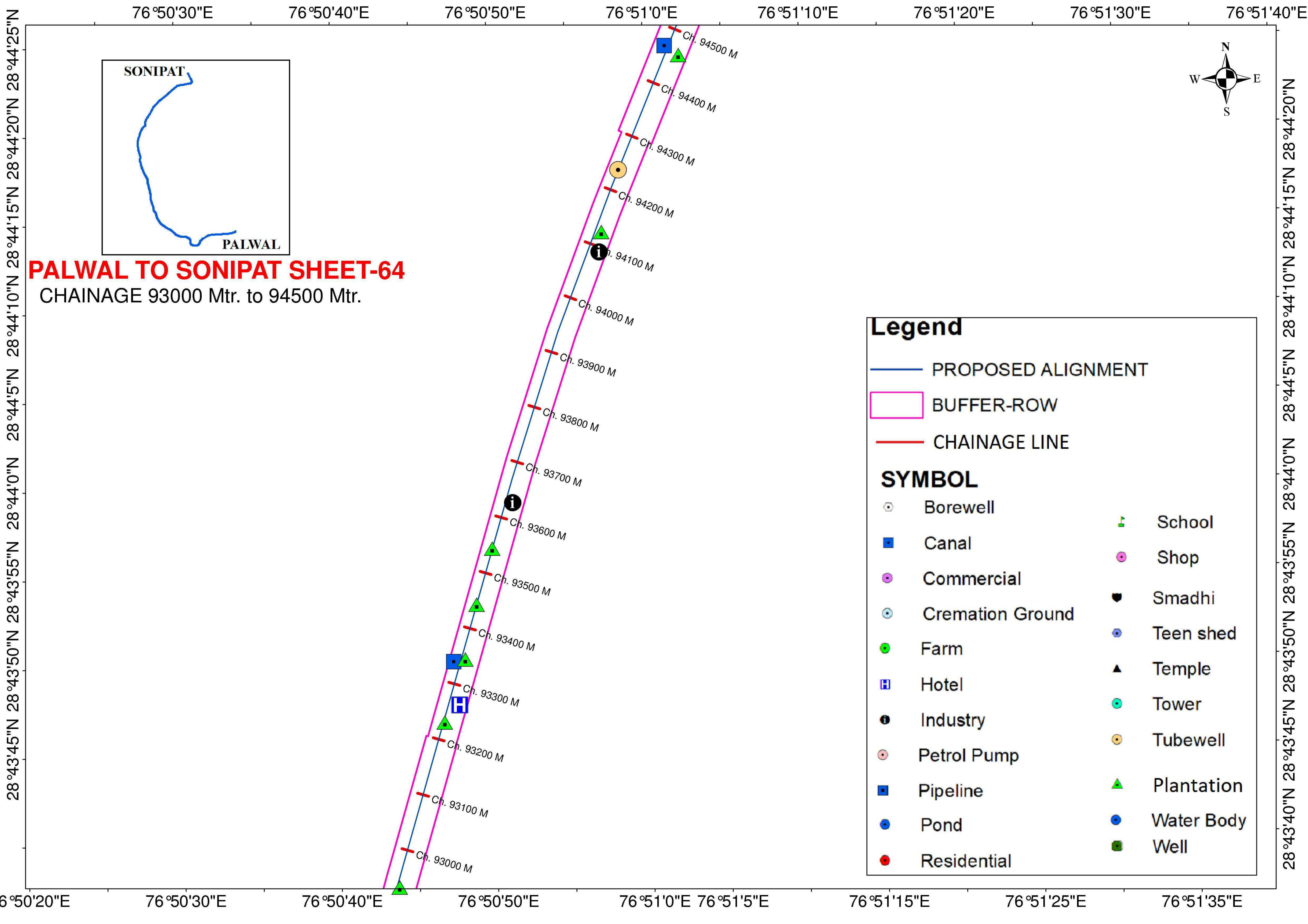
PALWAL TO SONIPAT SHEET-63
CHAINAGE 91500 Mtr. to 93000 Mtr.

Legend

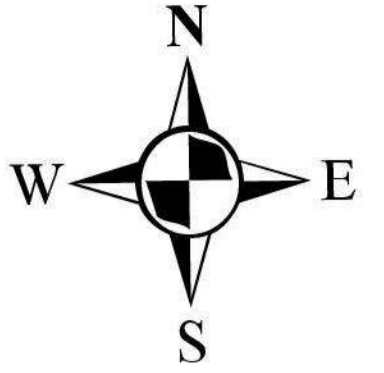
- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	♣ Smadhi
⊙ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



PALWAL TO SONIPAT SHEET-64
CHAINAGE 93000 Mtr. to 94500 Mtr.



Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

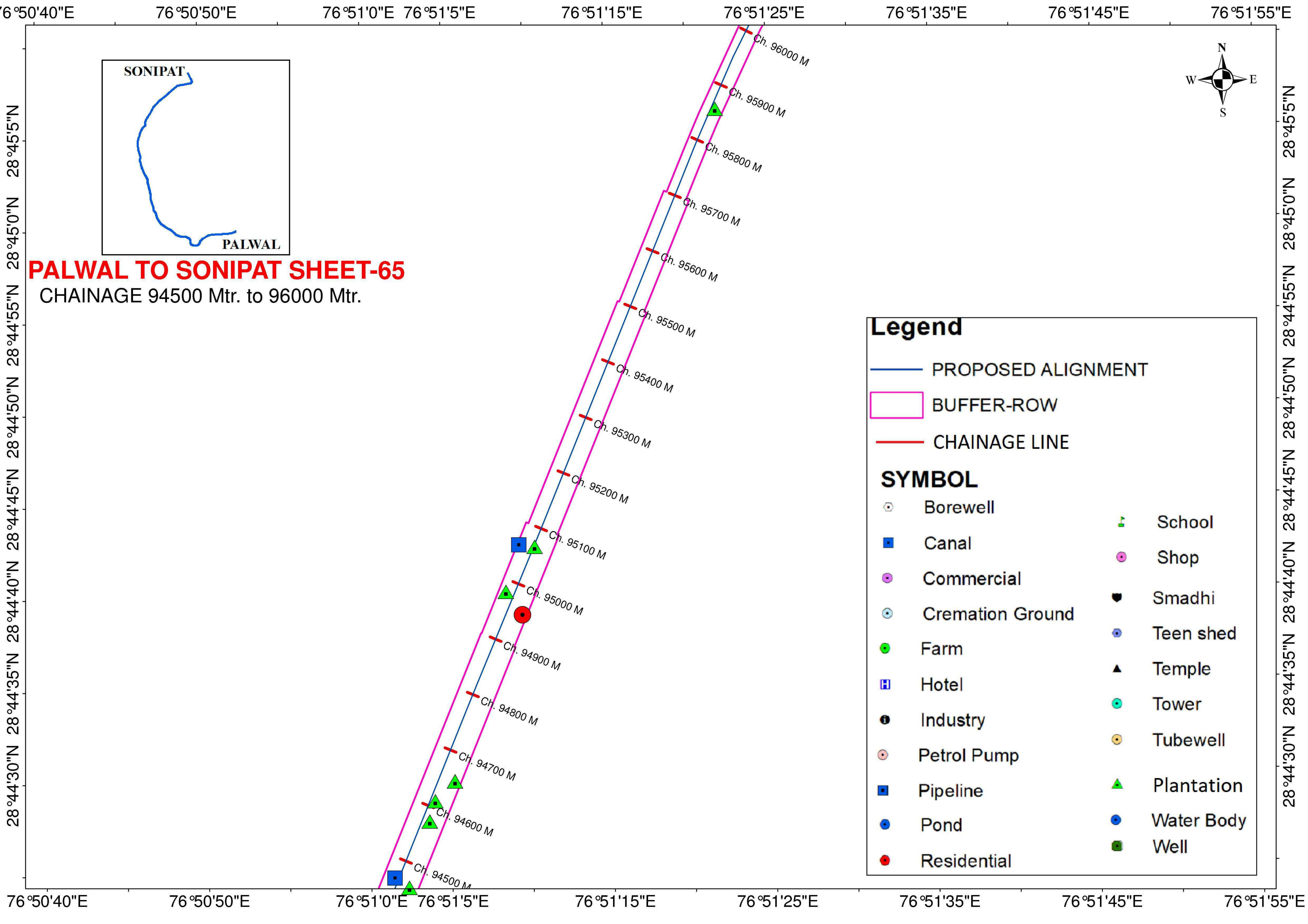
SYMBOL

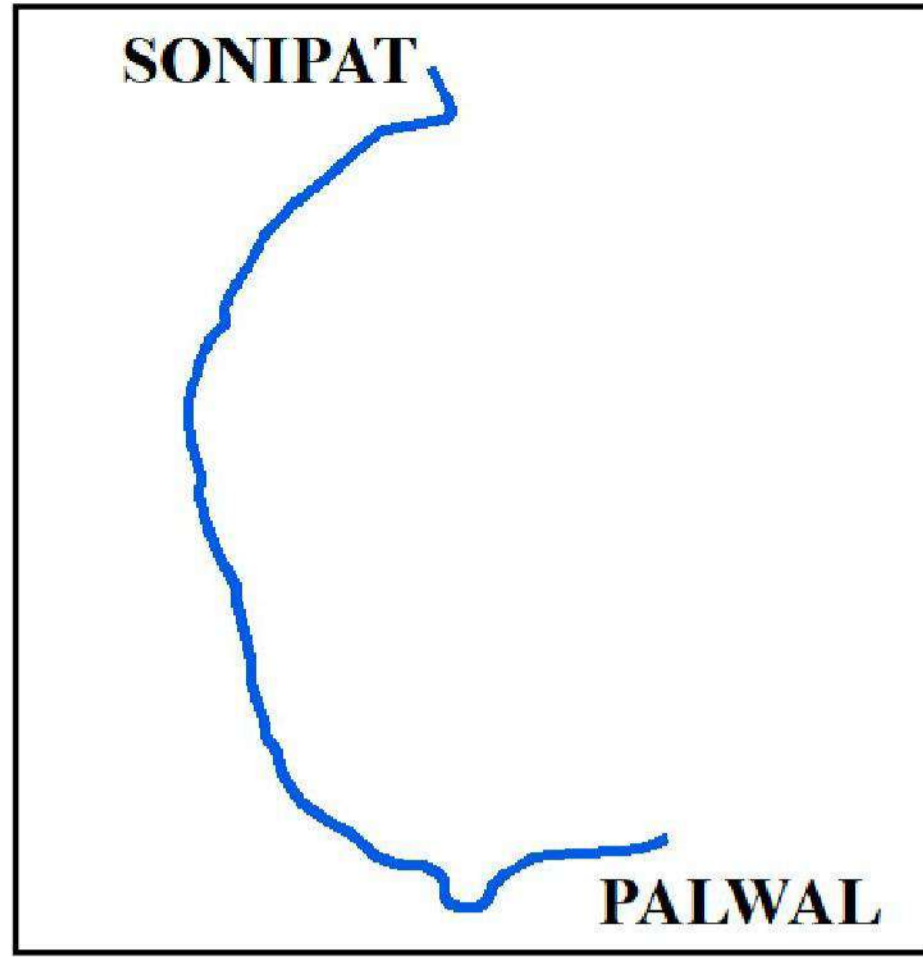
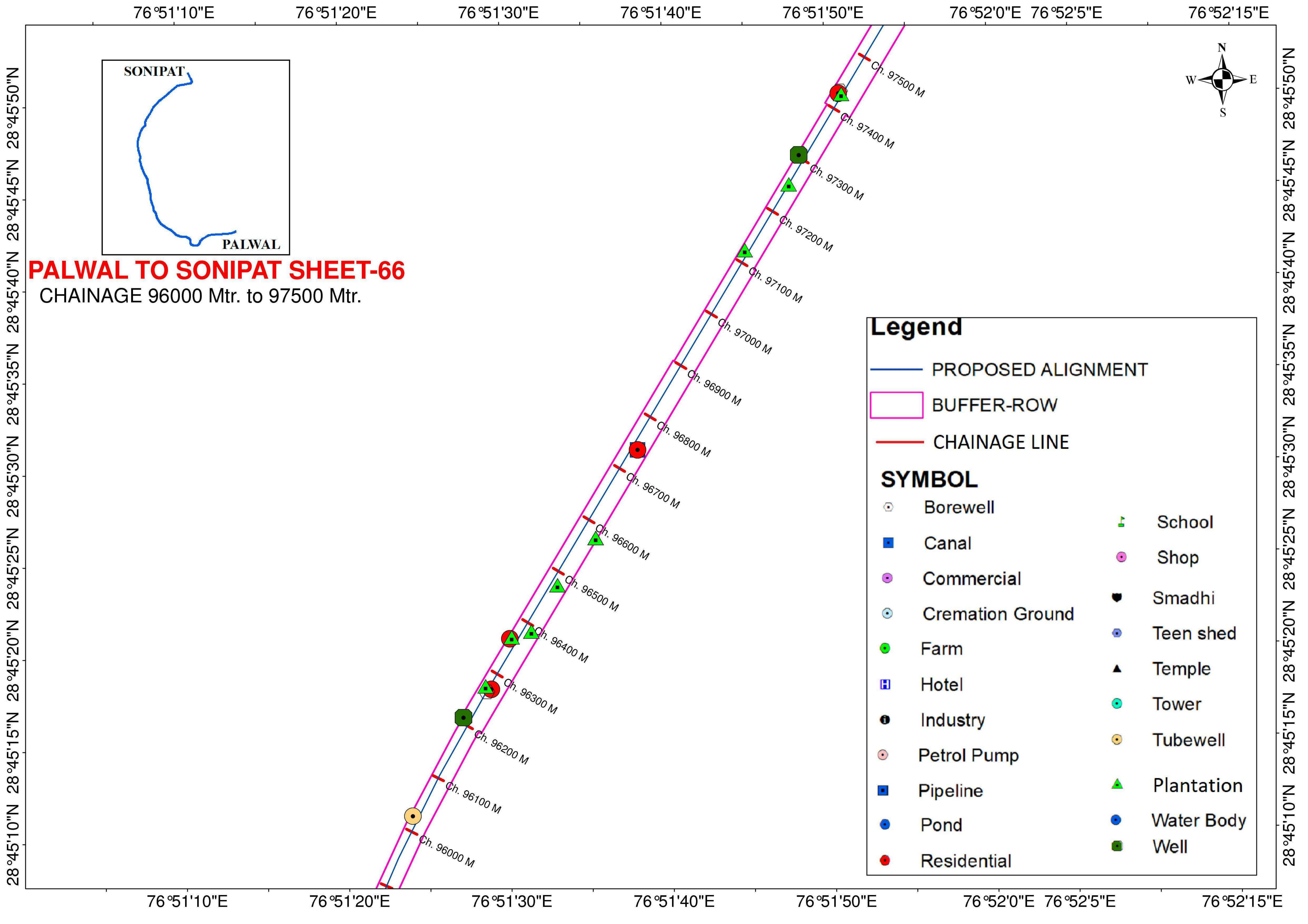
	Borewell		School
	Canal		Shop
	Commercial		Smadhi
	Cremation Ground		Teen shed
	Farm		Temple
	Hotel		Tower
	Industry		Tubewell
	Petrol Pump		Plantation
	Pipeline		Water Body
	Pond		Well
	Residential		

76°50'30"E 76°50'40"E 76°50'50"E 76°51'0"E 76°51'10"E 76°51'20"E 76°51'30"E 76°51'40"E

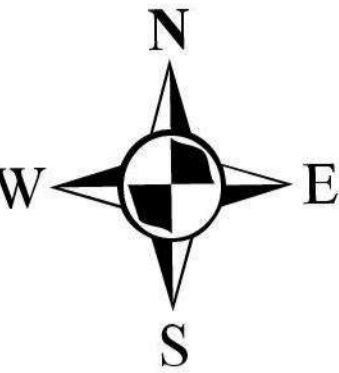
28°43'40"N 28°43'45"N 28°43'50"N 28°43'55"N 28°44'0"N 28°44'05"N 28°44'10"N 28°44'15"N 28°44'20"N 28°44'25"N

6°50'20"E 76°50'30"E 76°50'40"E 76°50'50"E 76°51'0"E 76°51'5"E 76°51'15"E 76°51'25"E 76°51'35"E





PALWAL TO SONIPAT SHEET-66
CHAINAGE 96000 Mtr. to 97500 Mtr.



Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

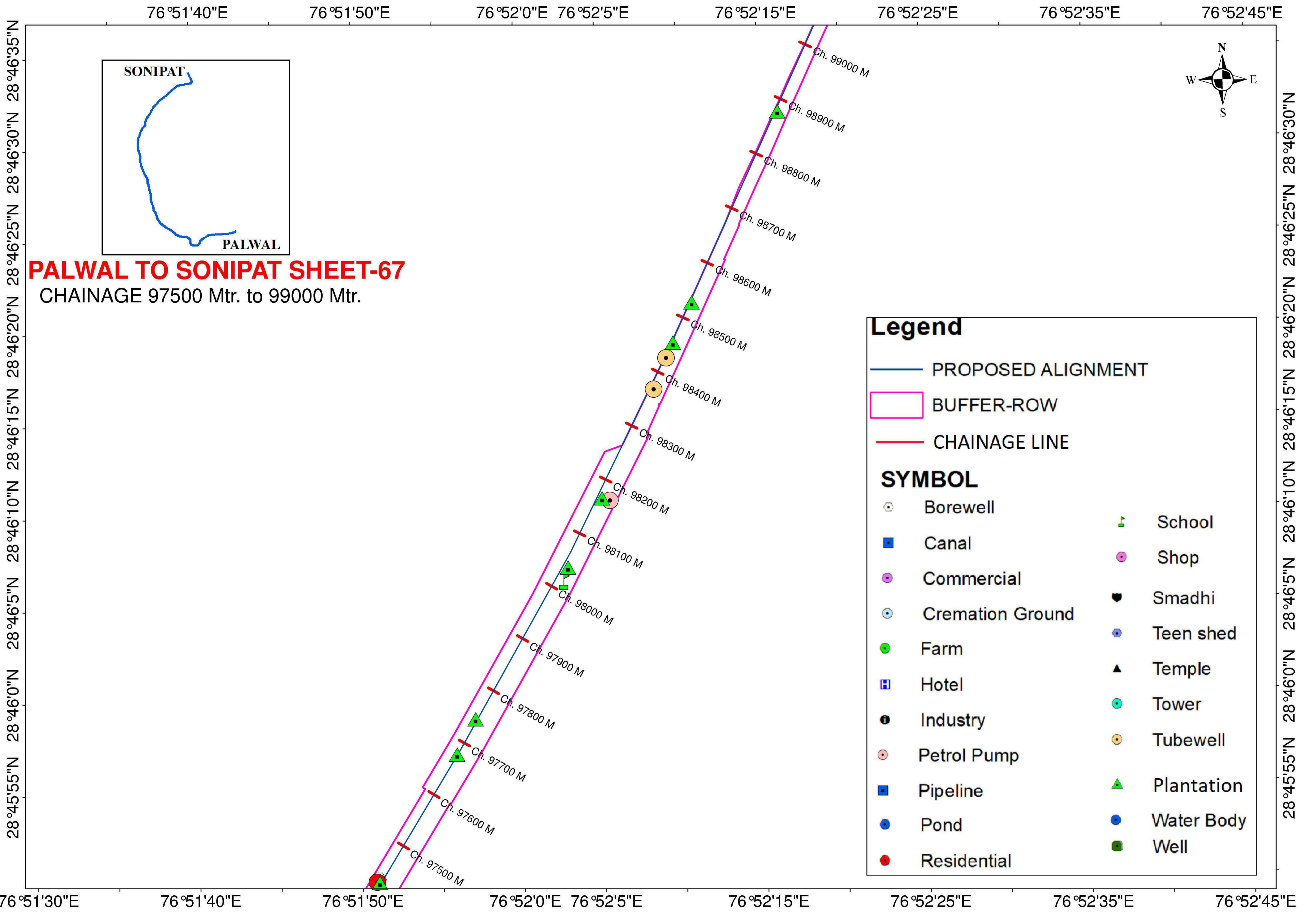
⊗ Borewell	▲ School
■ Canal	● Shop
● Commercial	⬛ Smadhi
⊙ Cremation Ground	⬢ Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

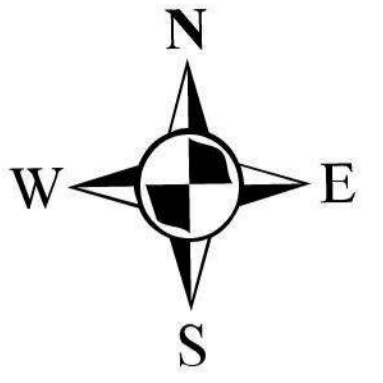
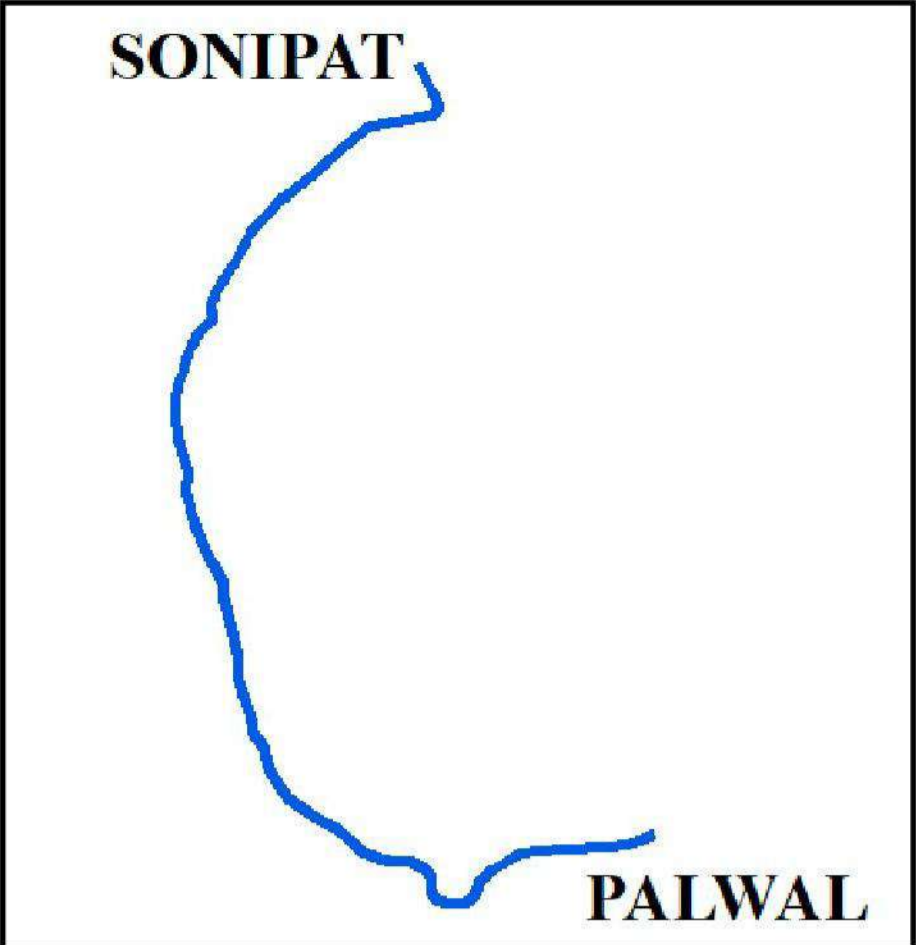
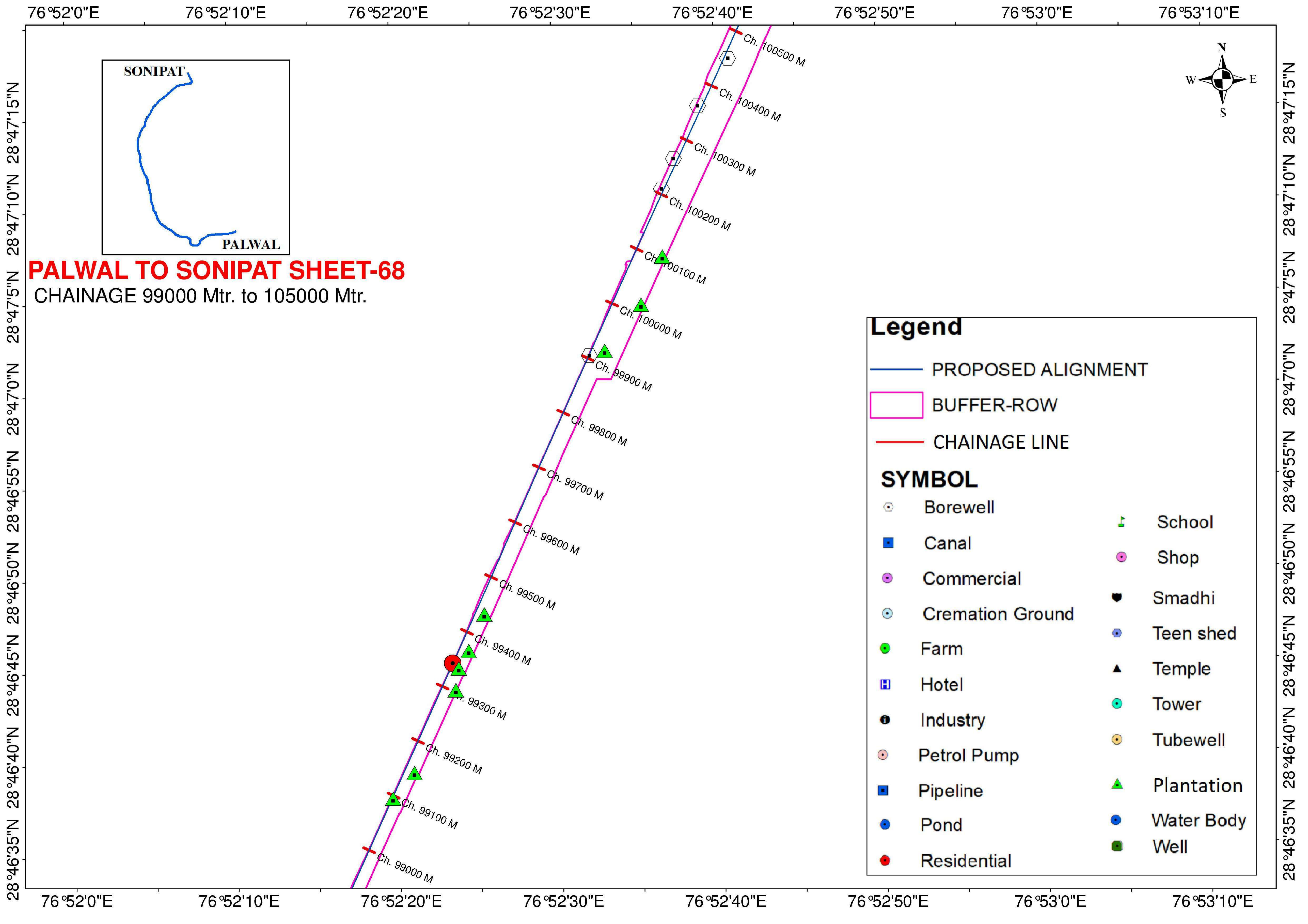
28°45'10"N 28°45'15"N 28°45'20"N 28°45'25"N 28°45'30"N 28°45'35"N 28°45'40"N 28°45'45"N 28°45'50"N

28°45'10"N 28°45'15"N 28°45'20"N 28°45'25"N 28°45'30"N 28°45'35"N 28°45'40"N 28°45'45"N 28°45'50"N

76°51'10"E 76°51'20"E 76°51'30"E 76°51'40"E 76°51'50"E 76°52'0"E 76°52'5"E 76°52'15"E

76°51'10"E 76°51'20"E 76°51'30"E 76°51'40"E 76°51'50"E 76°52'0"E 76°52'5"E 76°52'15"E





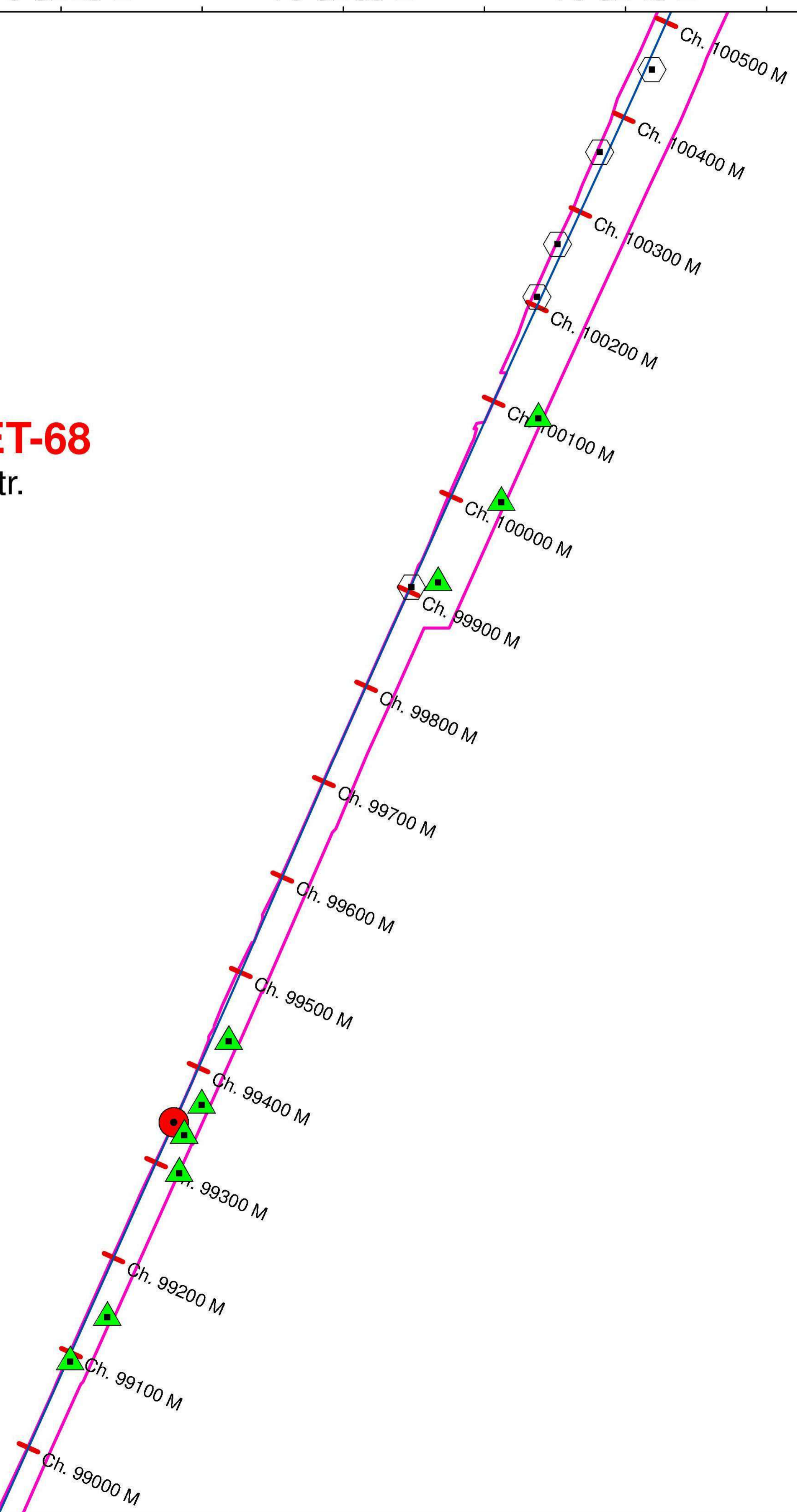
PALWAL TO SONIPAT SHEET-68
CHAINAGE 99000 Mtr. to 105000 Mtr.

Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

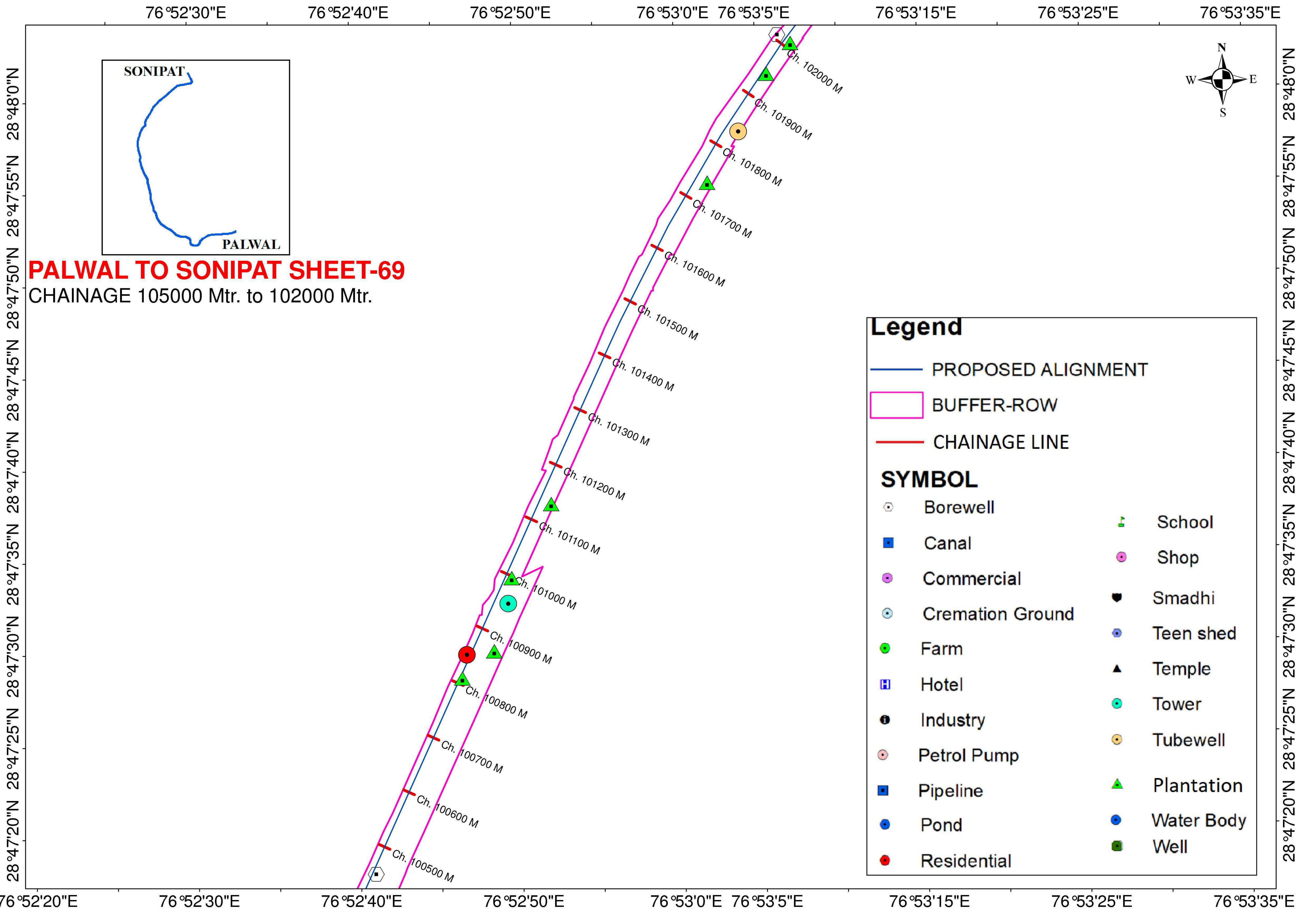
SYMBOL

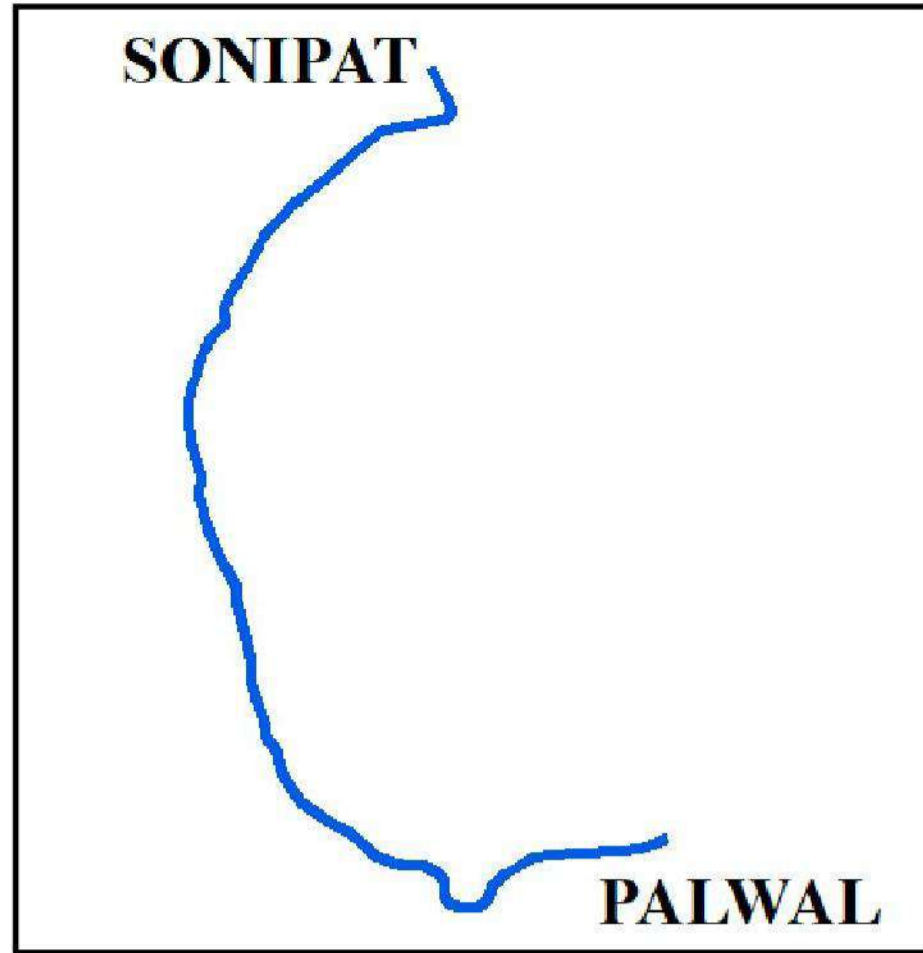
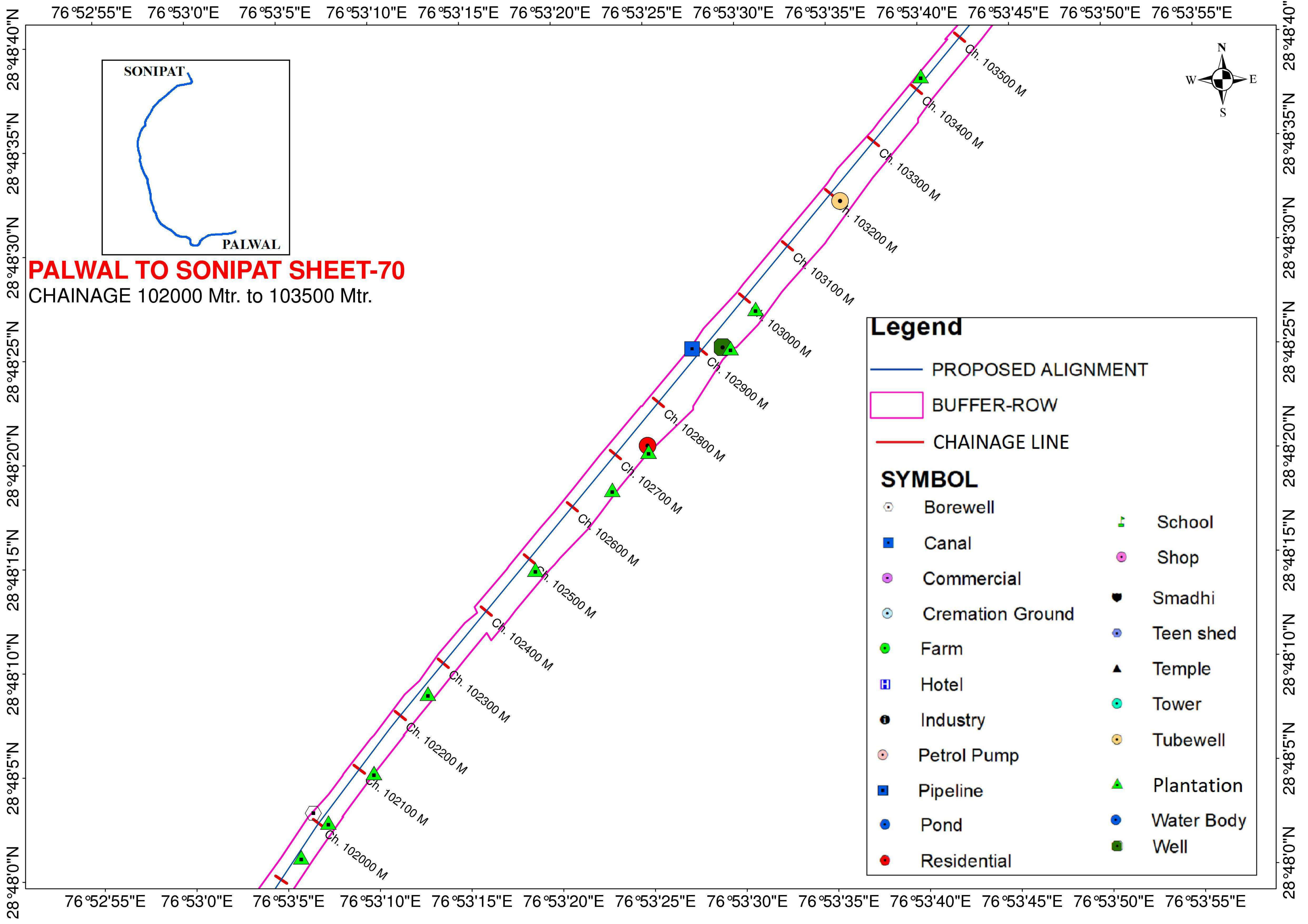
	Borewell		School
	Canal		Shop
	Commercial		Smadhi
	Cremation Ground		Teen shed
	Farm		Temple
	Hotel		Tower
	Industry		Tubewell
	Petrol Pump		Plantation
	Pipeline		Water Body
	Pond		Well
	Residential		



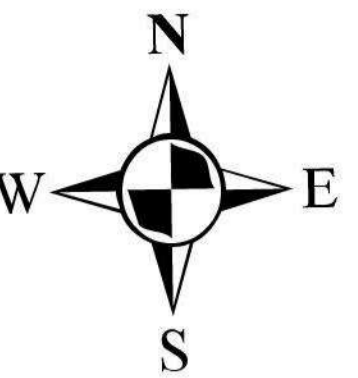
28°46'35"N
28°46'40"N
28°46'45"N
28°46'50"N
28°46'55"N
28°47'0"N
28°47'5"N
28°47'10"N
28°47'15"N

76°52'0"E
76°52'10"E
76°52'20"E
76°52'30"E
76°52'40"E
76°52'50"E
76°53'0"E
76°53'10"E





PALWAL TO SONIPAT SHEET-70
CHAINAGE 102000 Mtr. to 103500 Mtr.

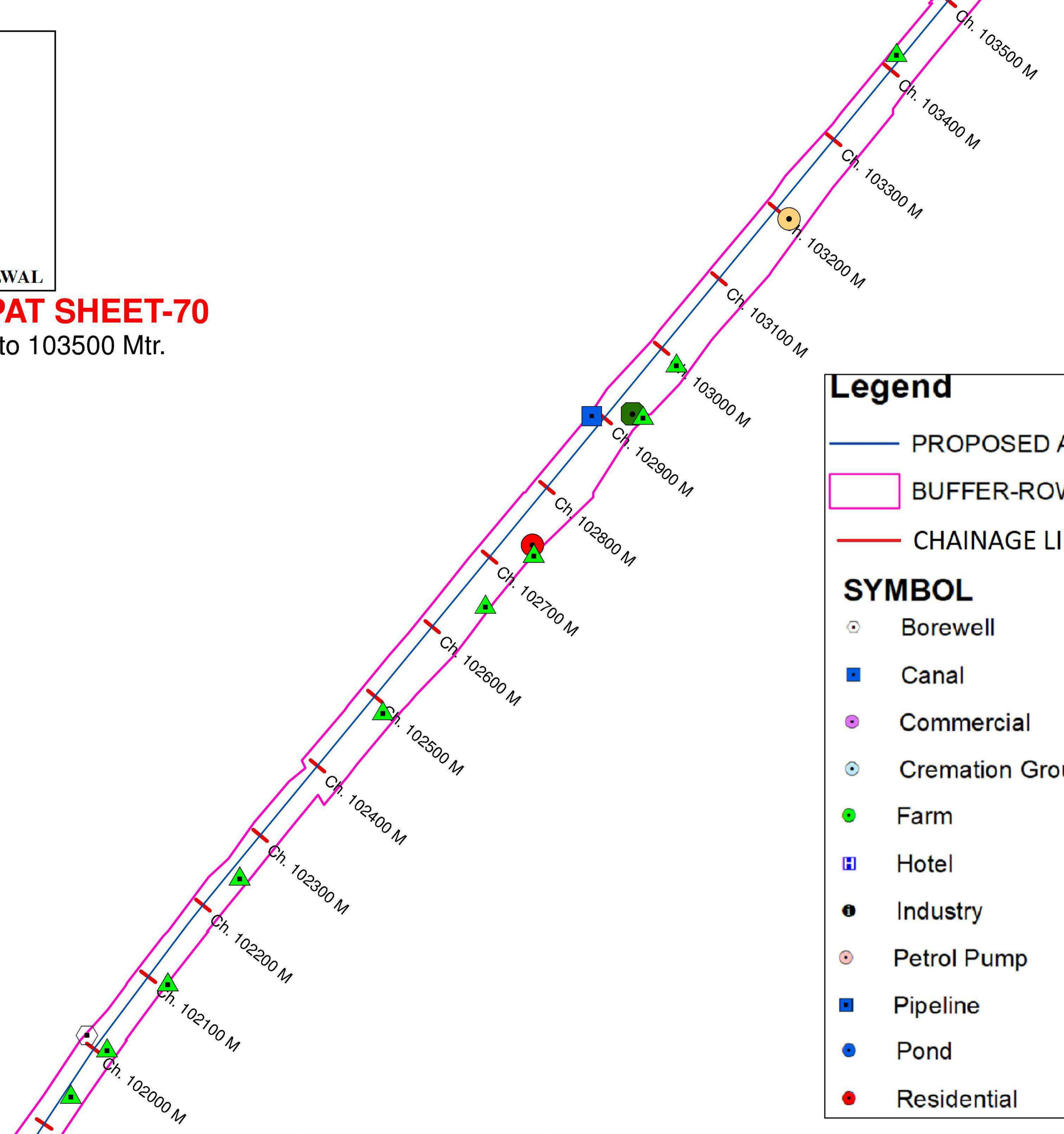


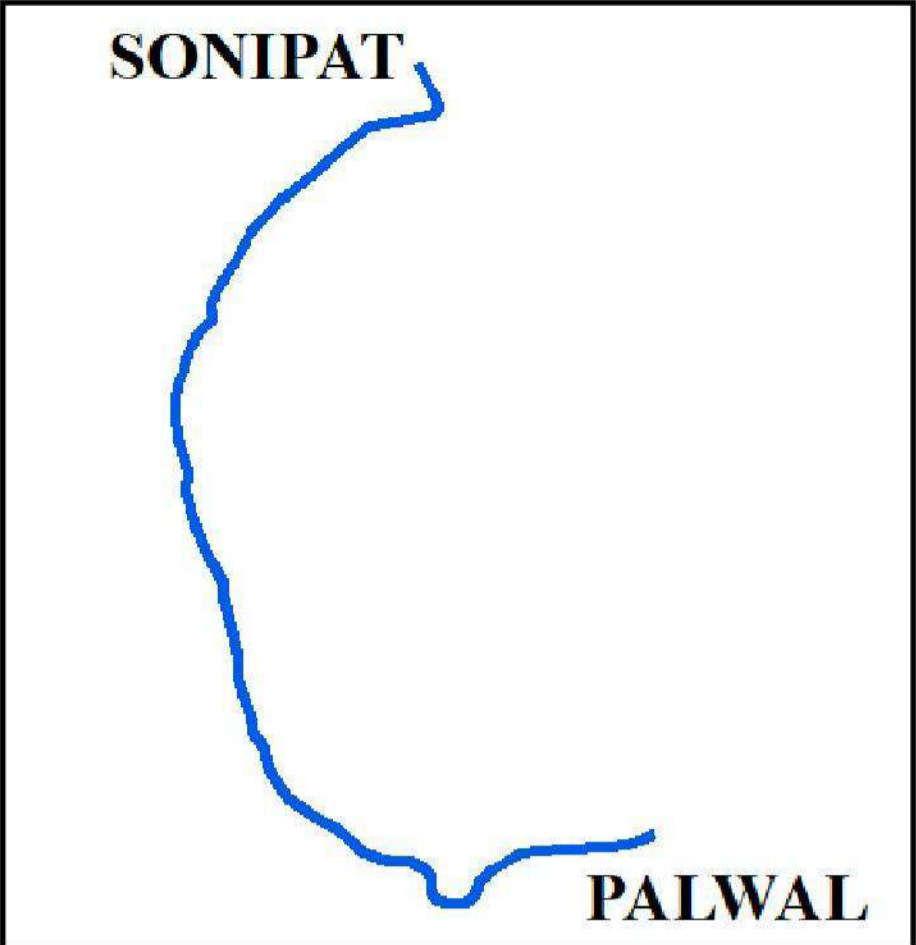
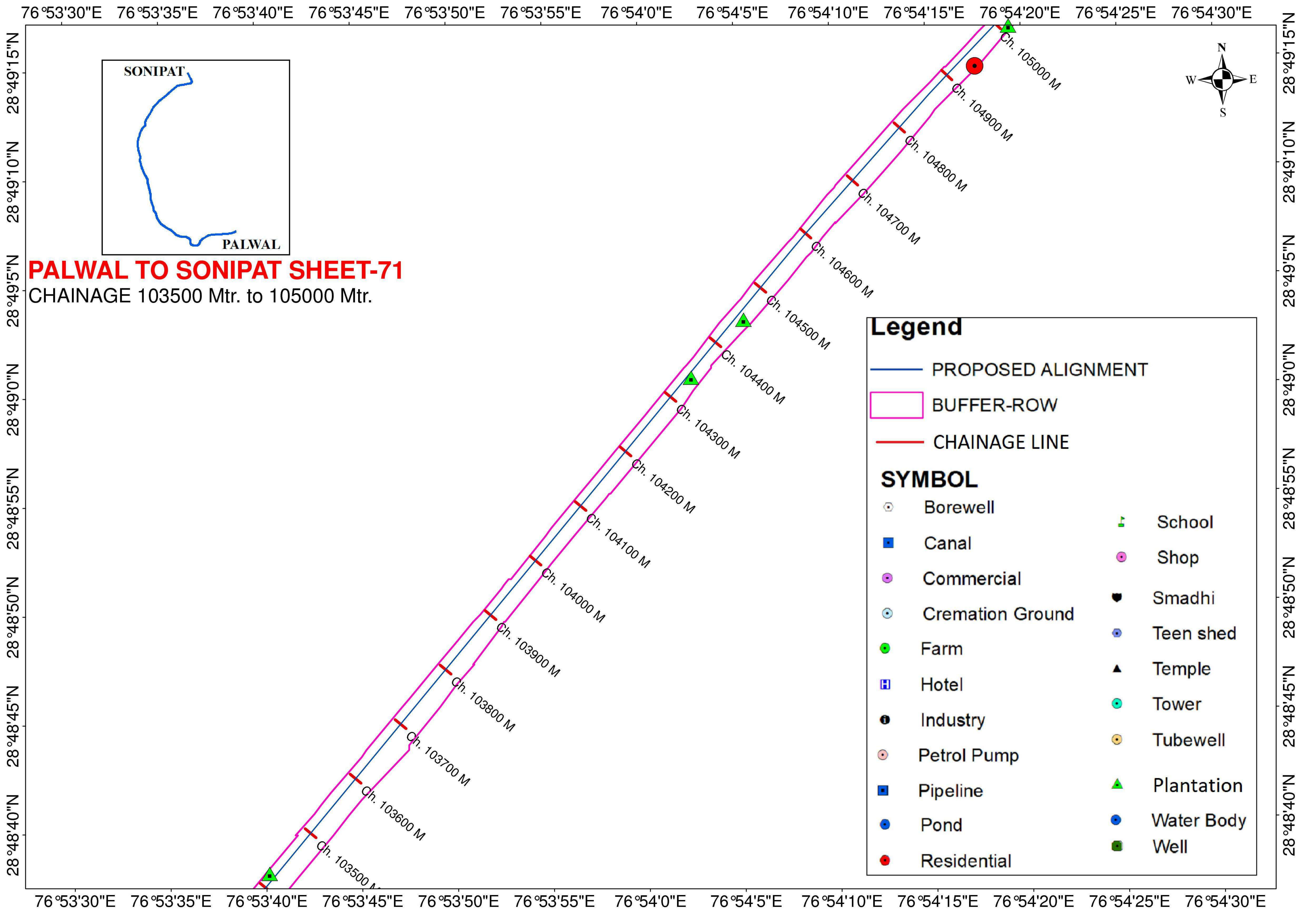
Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

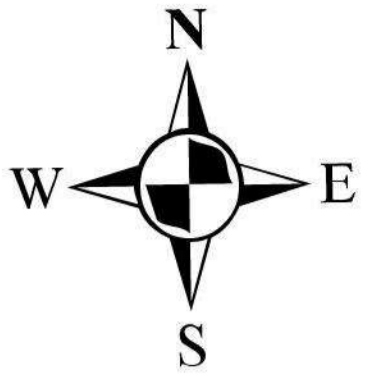
SYMBOL

 Borewell	▲ School
■ Canal	 Shop
 Commercial	■ Smadhi
 Cremation Ground	 Teen shed
● Farm	▲ Temple
 Hotel	 Tower
● Industry	 Tubewell
 Petrol Pump	▲ Plantation
 Pipeline	 Water Body
 Pond	■ Well
● Residential	





PALWAL TO SONIPAT SHEET-71
 CHAINAGE 103500 Mtr. to 105000 Mtr.



Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	⬛ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

76°53'30"E 76°53'35"E 76°53'40"E 76°53'45"E 76°53'50"E 76°53'55"E 76°54'0"E 76°54'5"E 76°54'10"E 76°54'15"E 76°54'20"E 76°54'25"E 76°54'30"E

28°48'40"N

28°48'45"N

28°48'50"N

28°48'55"N

28°49'0"N

28°49'5"N

28°49'10"N

28°49'15"N

28°48'40"N

28°48'45"N

28°48'50"N

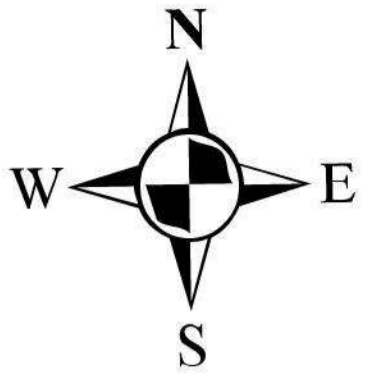
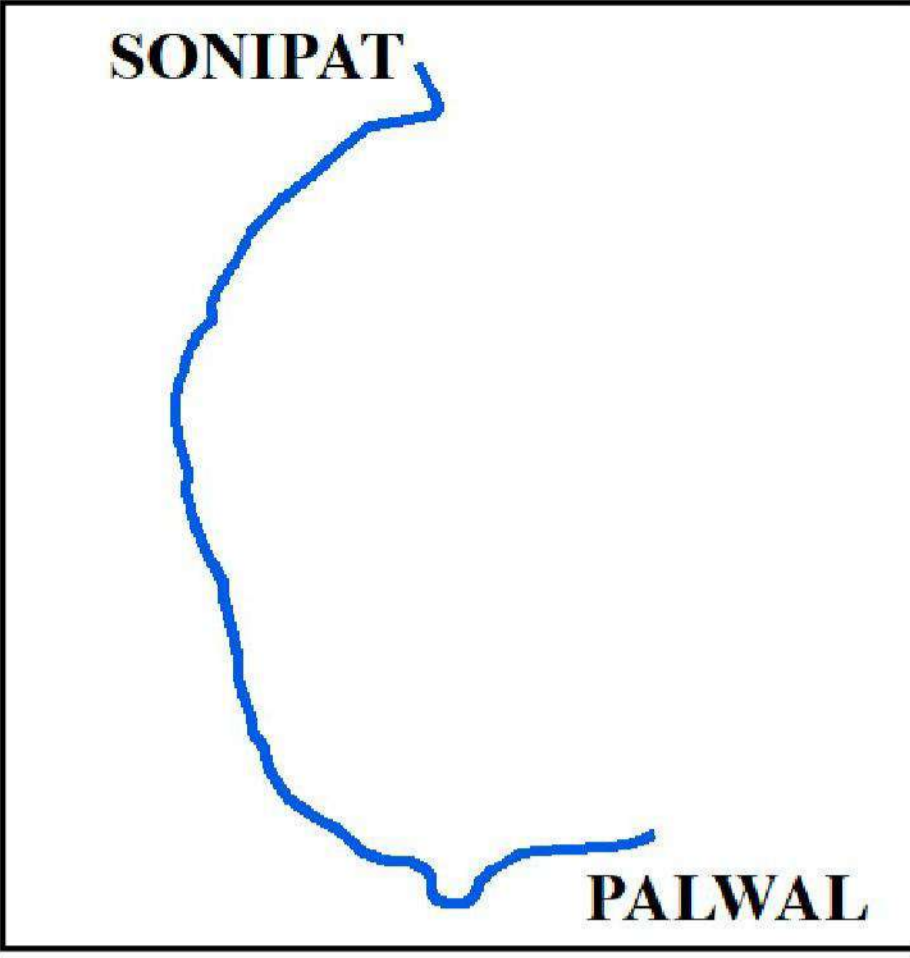
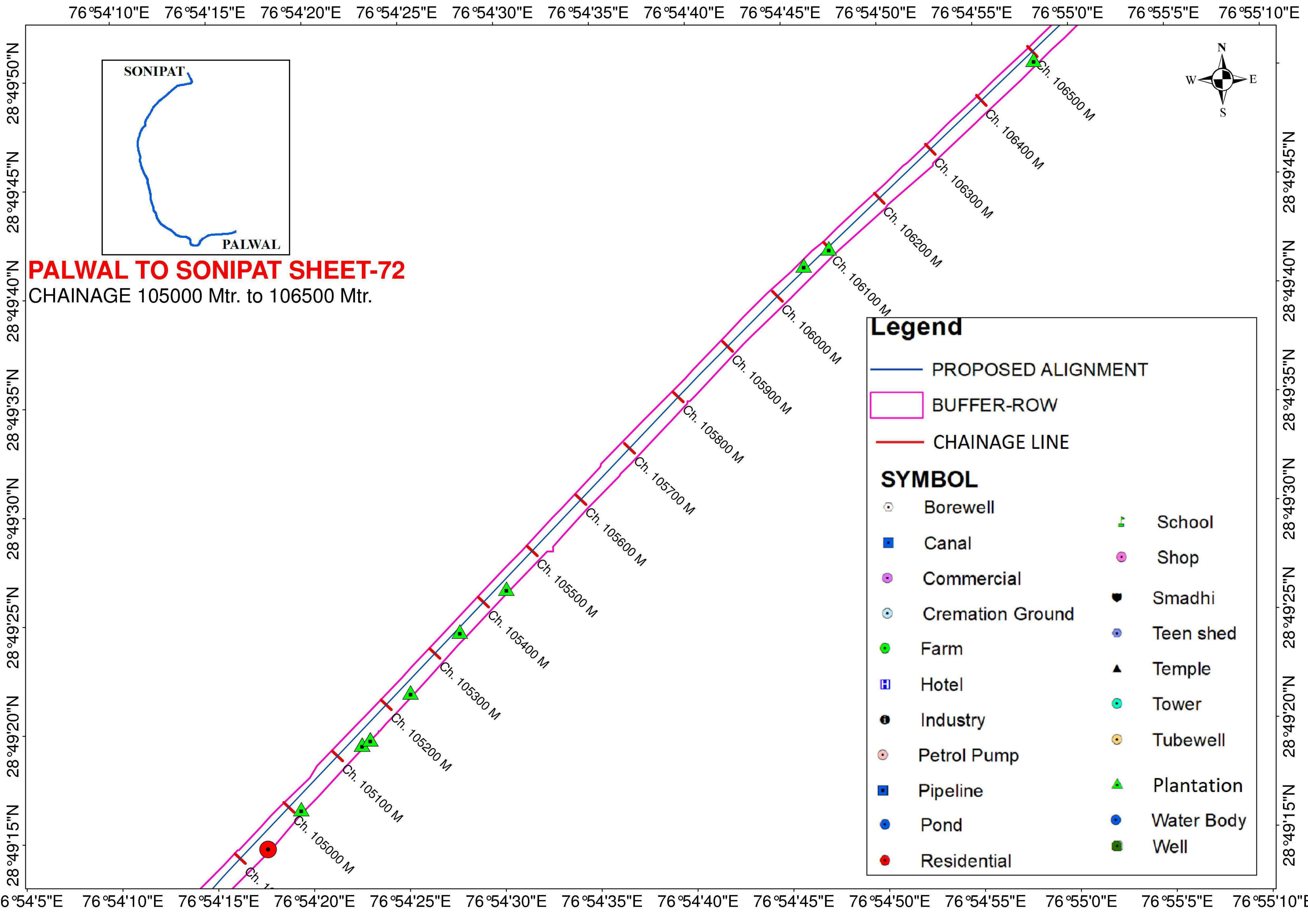
28°48'55"N

28°49'0"N

28°49'5"N

28°49'10"N

28°49'15"N



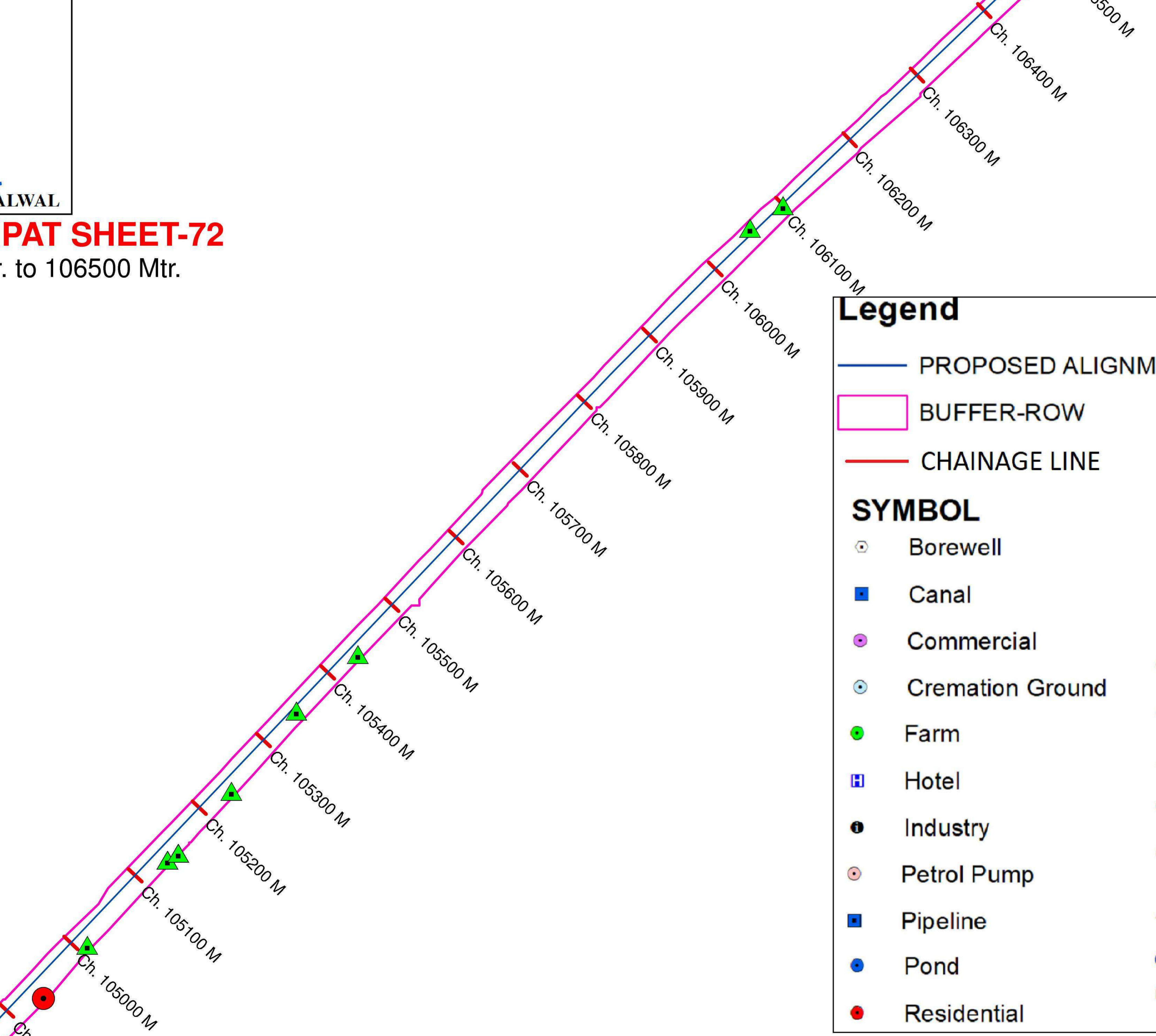
PALWAL TO SONIPAT SHEET-72
 CHAINAGE 105000 Mtr. to 106500 Mtr.

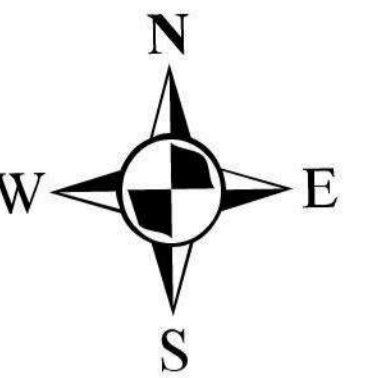
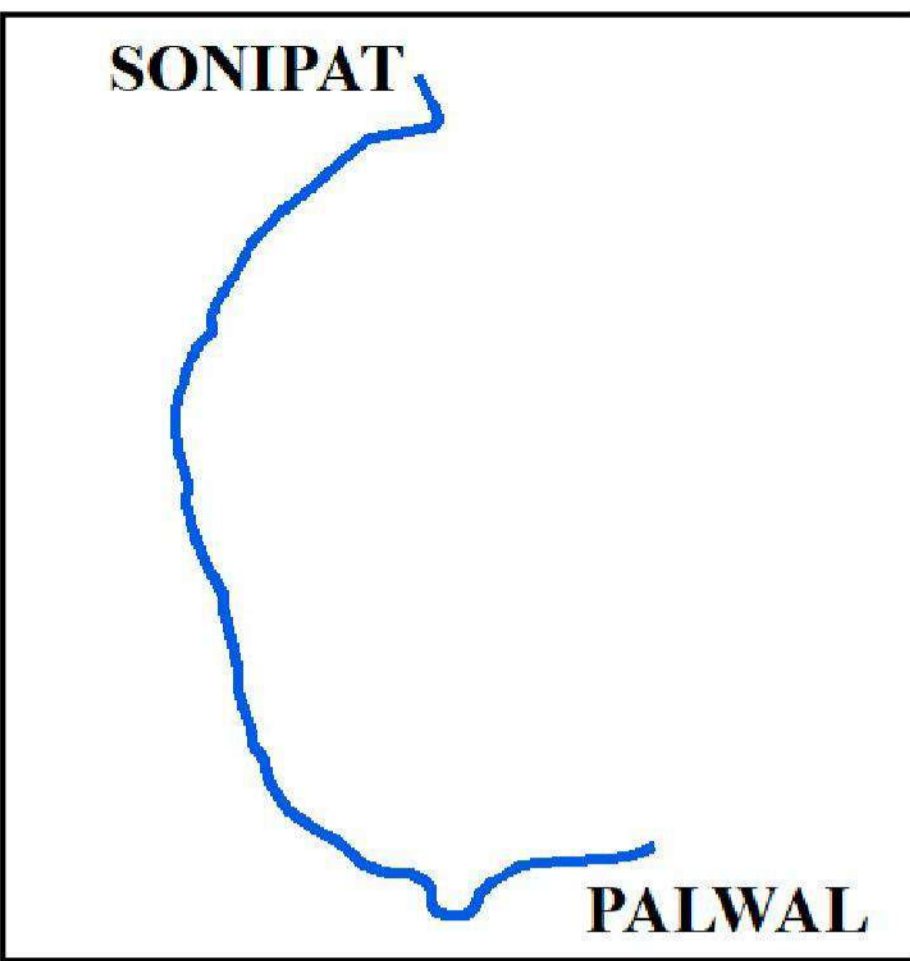
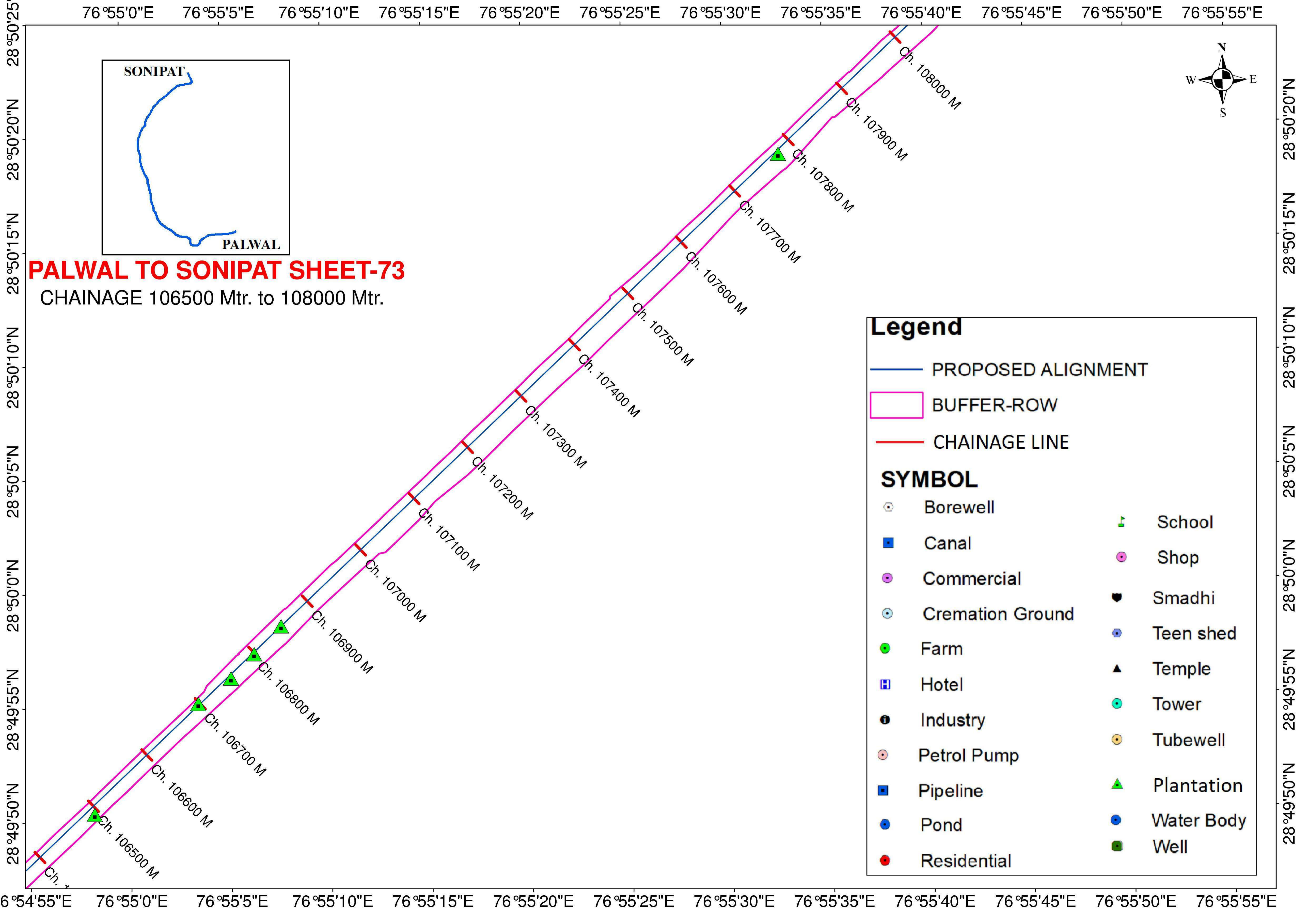
Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

⊙ Borewell	▲ School
■ Canal	● Shop
● Commercial	☪ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	





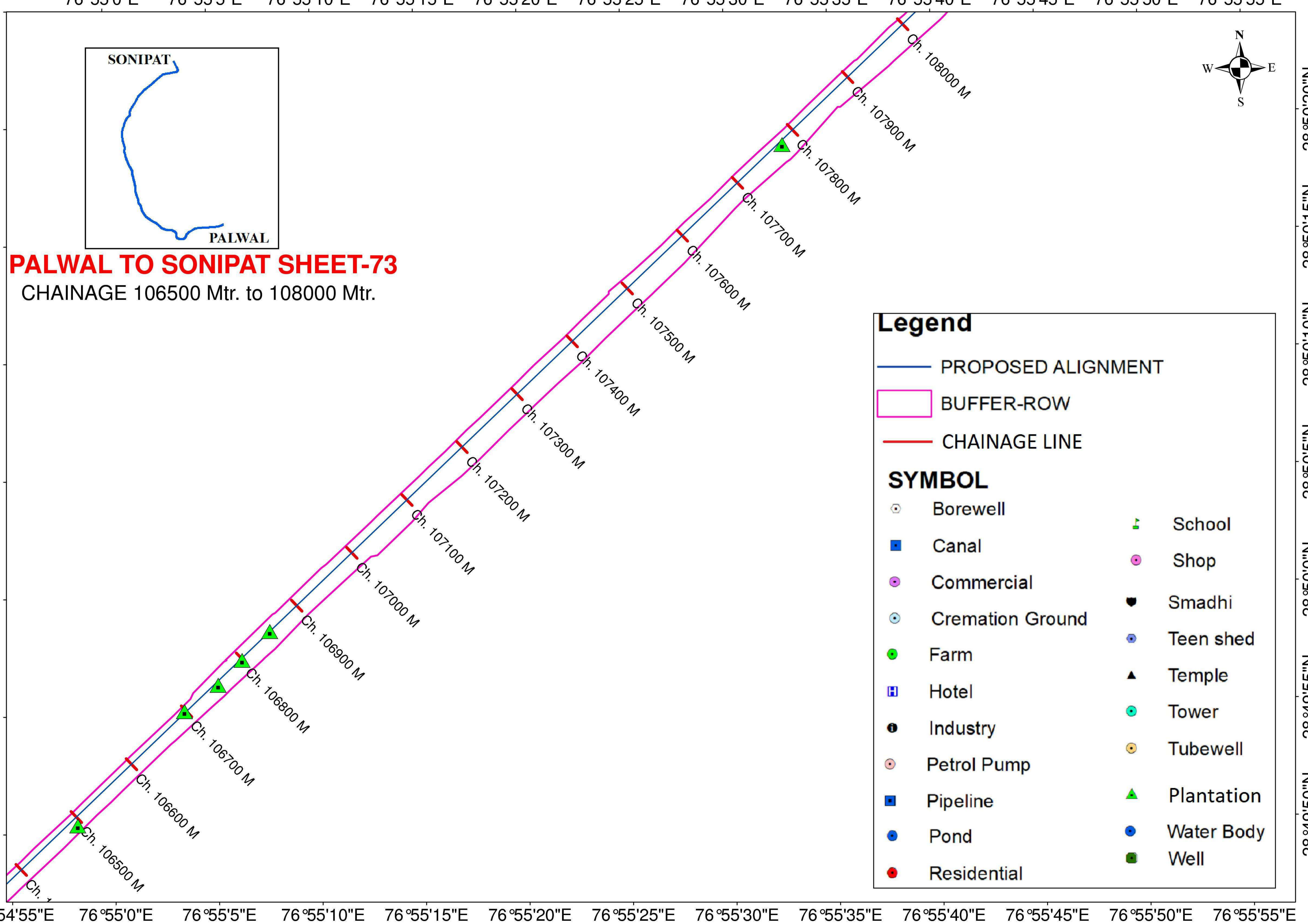
PALWAL TO SONIPAT SHEET-73
CHAINAGE 106500 Mtr. to 108000 Mtr.

Legend

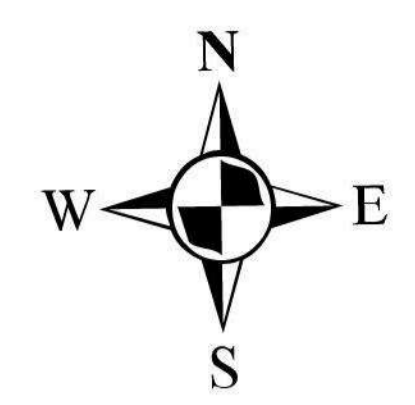
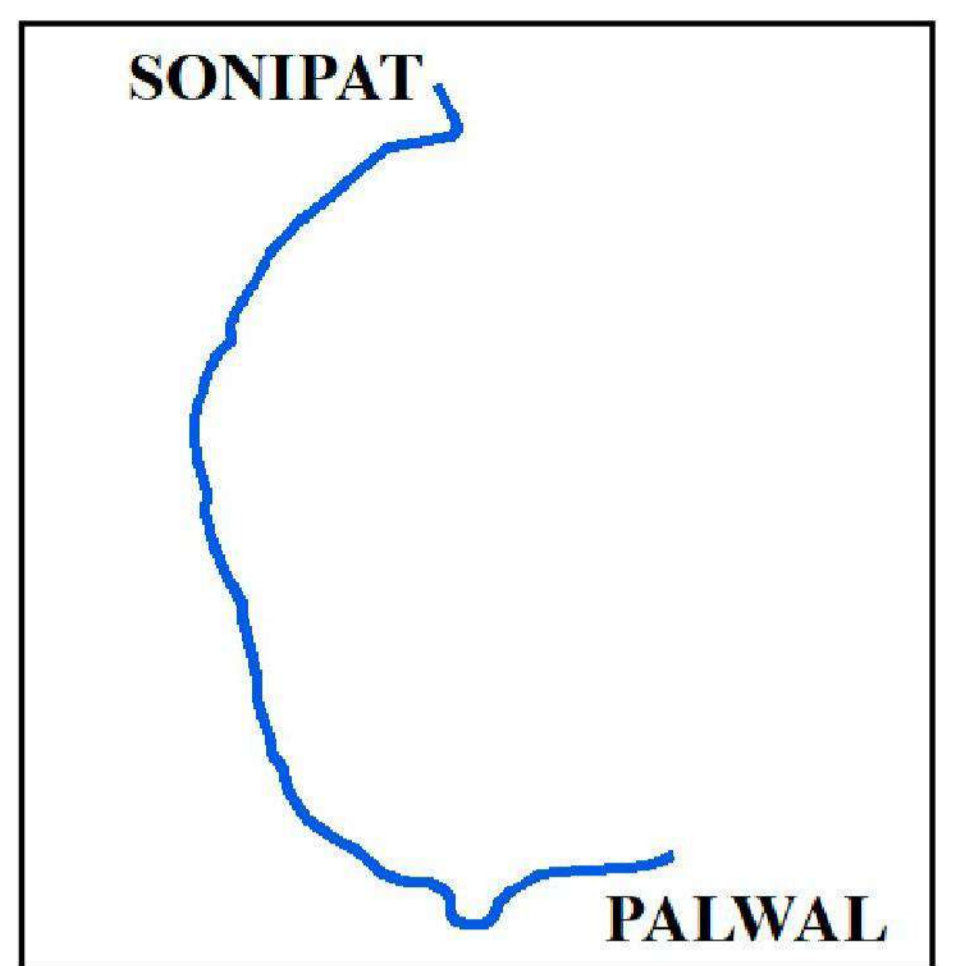
- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

- Borewell
- Canal
- Commercial
- Cremation Ground
- Farm
- Hotel
- Industry
- Petrol Pump
- Pipeline
- Pond
- Residential
- School
- Shop
- Smadhi
- Teen shed
- Temple
- Tower
- Tubewell
- Plantation
- Water Body
- Well

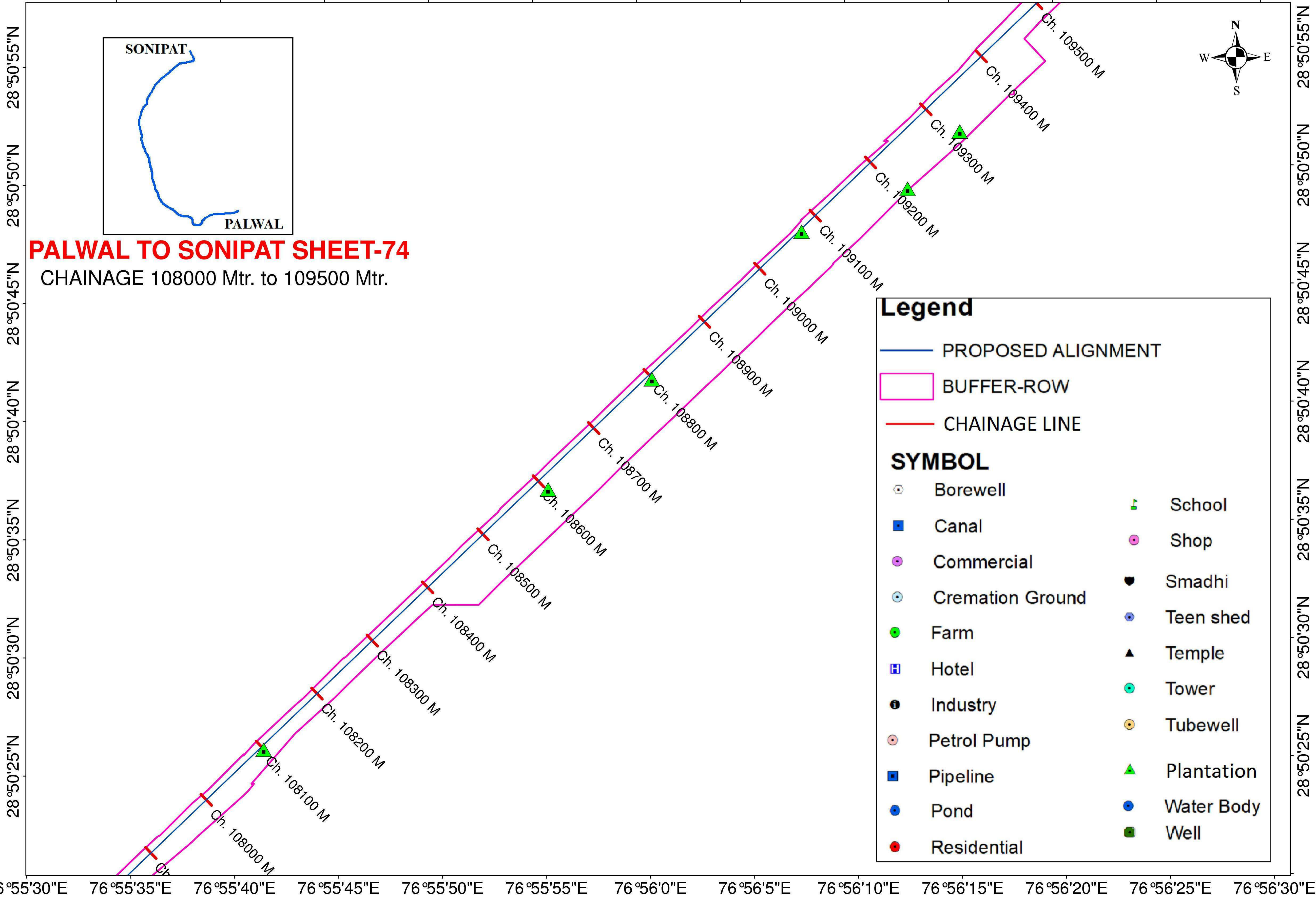


76°55'35"E 76°55'40"E 76°55'45"E 76°55'50"E 76°55'55"E 76°56'0"E 76°56'5"E 76°56'10"E 76°56'15"E 76°56'20"E 76°56'25"E 76°56'30"E



PALWAL TO SONIPAT SHEET-74

CHAINAGE 108000 Mtr. to 109500 Mtr.

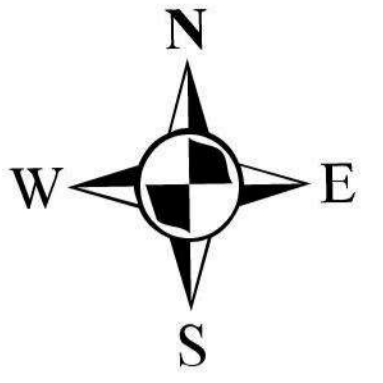
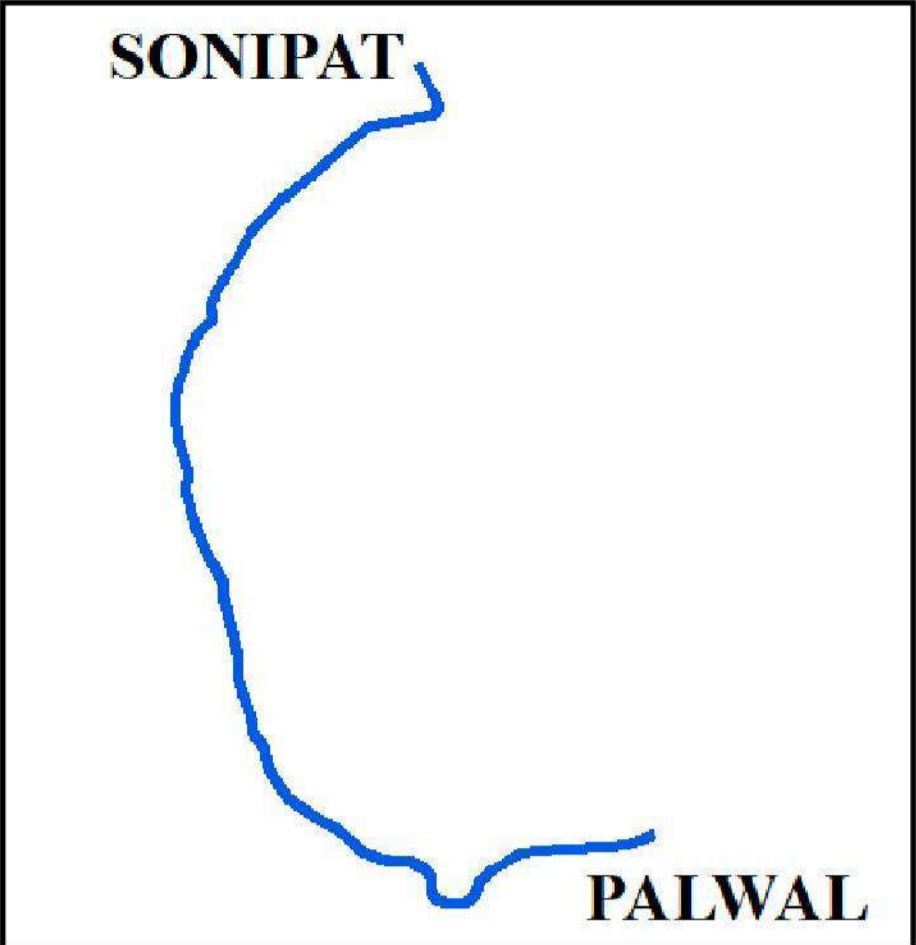
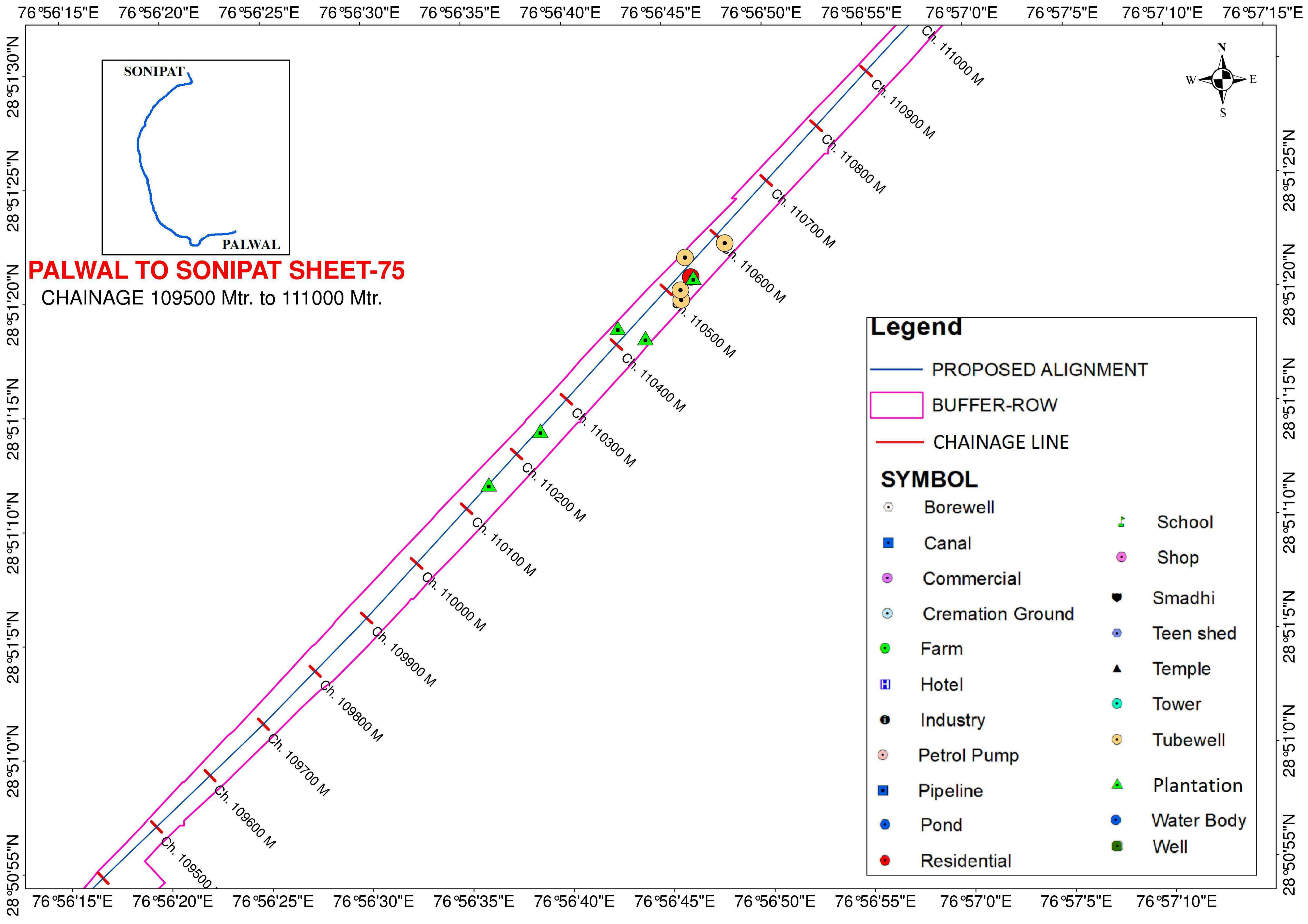


Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

◻	Borewell	▲	School
■	Canal	●	Shop
●	Commercial	⬛	Smadhi
⊙	Cremation Ground	⬢	Teen shed
●	Farm	▲	Temple
■	Hotel	⊙	Tower
●	Industry	●	Tubewell
●	Petrol Pump	▲	Plantation
■	Pipeline	●	Water Body
●	Pond	■	Well
●	Residential		



PALWAL TO SONIPAT SHEET-75
CHAINAGE 109500 Mtr. to 111000 Mtr.

Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

○ Borewell	▲ Plantation
■ Canal	● Shop
● Commercial	⬛ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	○ Tubewell
○ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

76°56'15"E 76°56'20"E 76°56'25"E 76°56'30"E 76°56'35"E 76°56'40"E 76°56'45"E 76°56'50"E 76°56'55"E 76°57'0"E 76°57'5"E 76°57'10"E 76°57'15"E

28°50'55"N

28°50'55"N

28°51'0"N

28°51'0"N

28°51'5"N

28°51'5"N

28°51'10"N

28°51'10"N

28°51'15"N

28°51'15"N

28°51'20"N

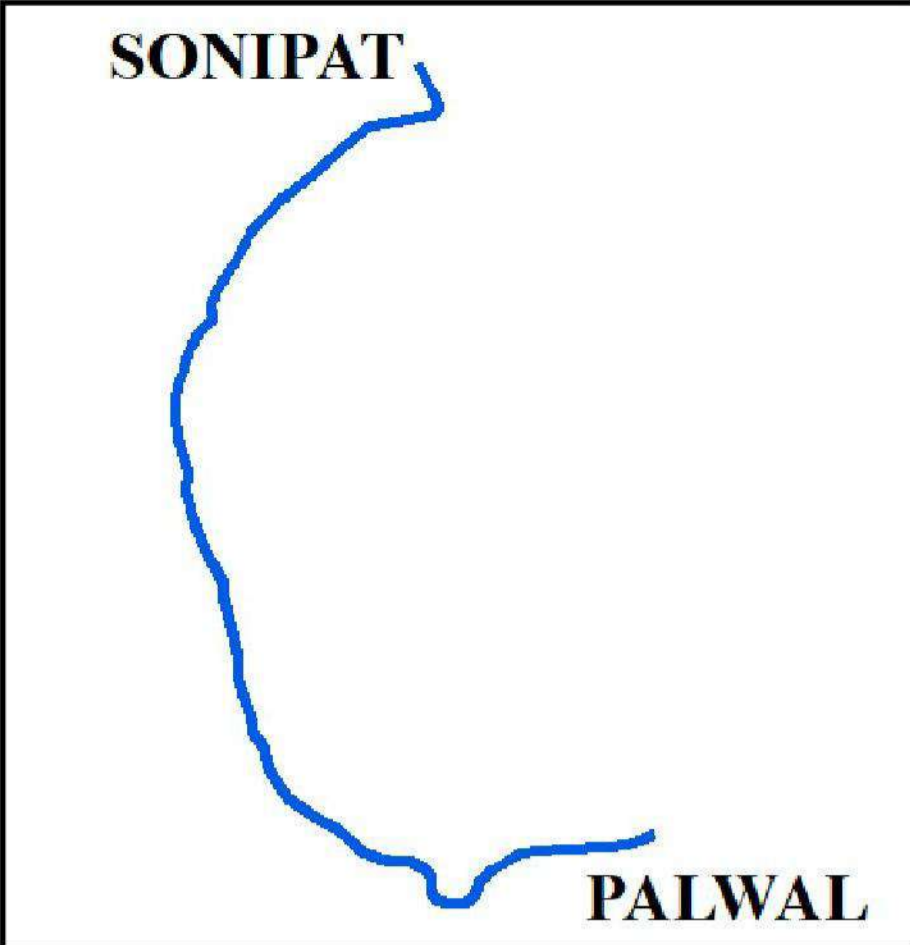
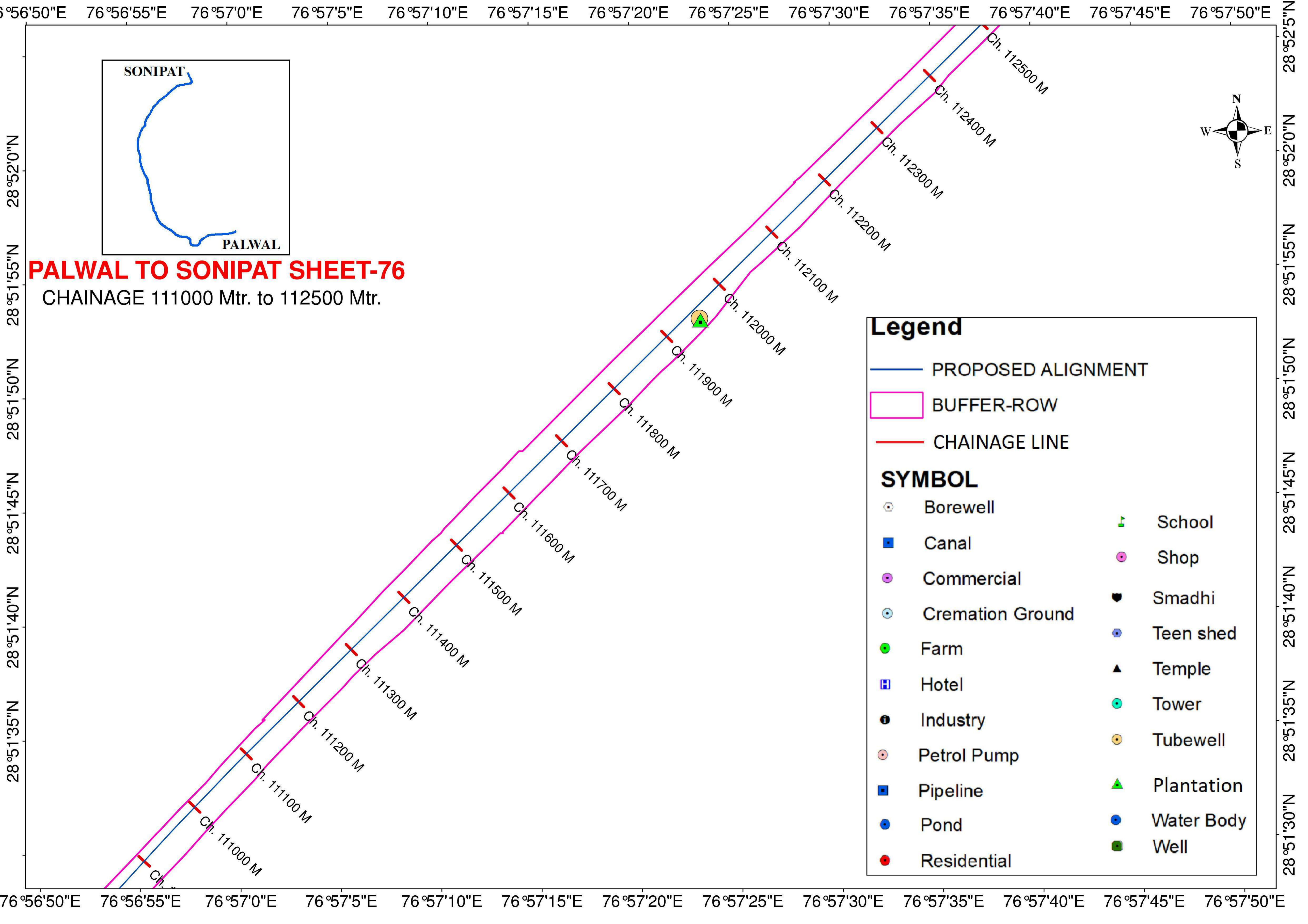
28°51'20"N

28°51'25"N

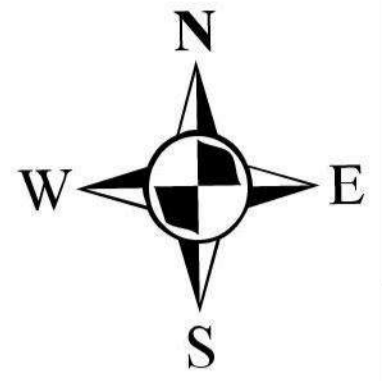
28°51'25"N

28°51'30"N

28°51'30"N



PALWAL TO SONIPAT SHEET-76
CHAINAGE 111000 Mtr. to 112500 Mtr.

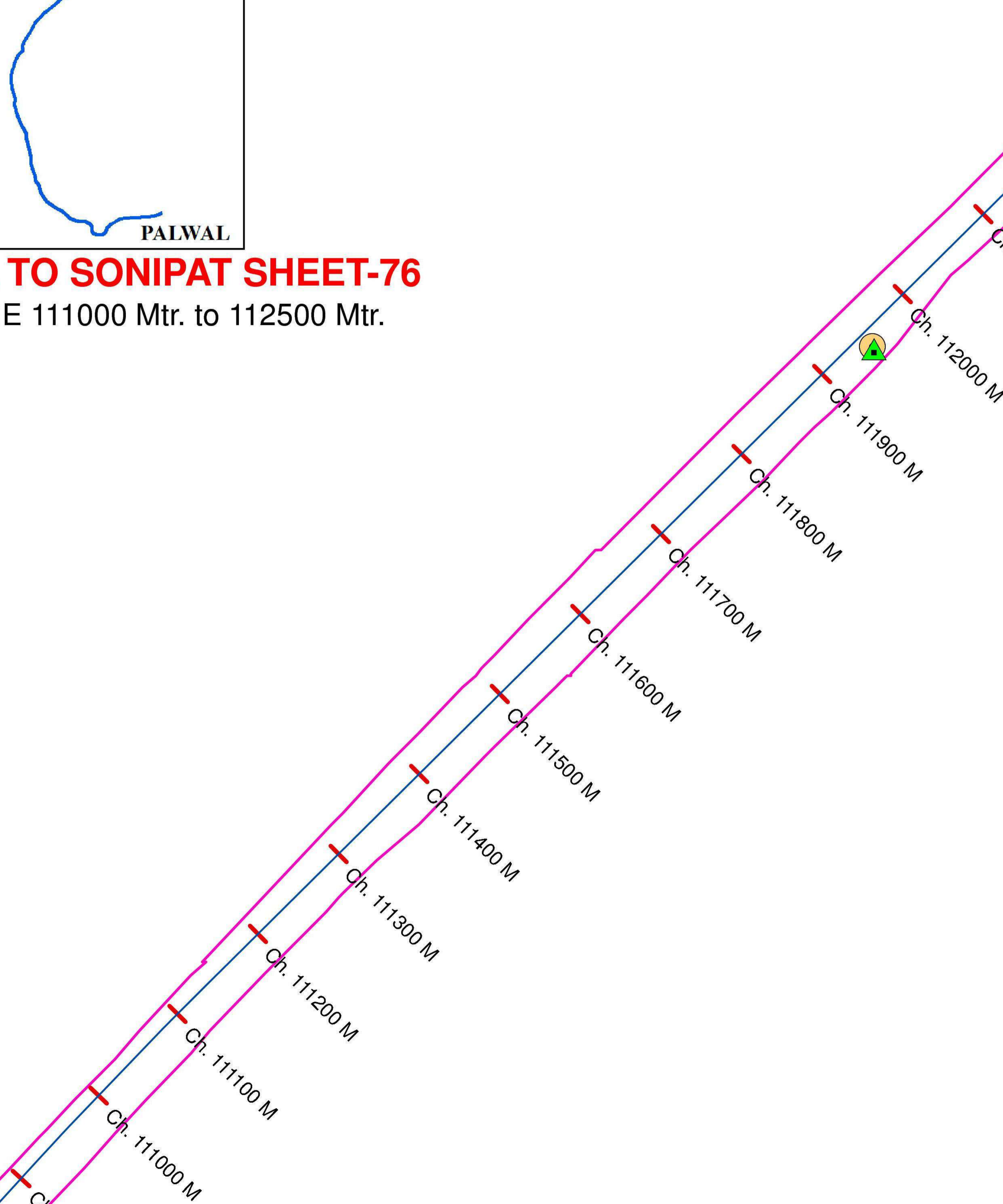


Legend

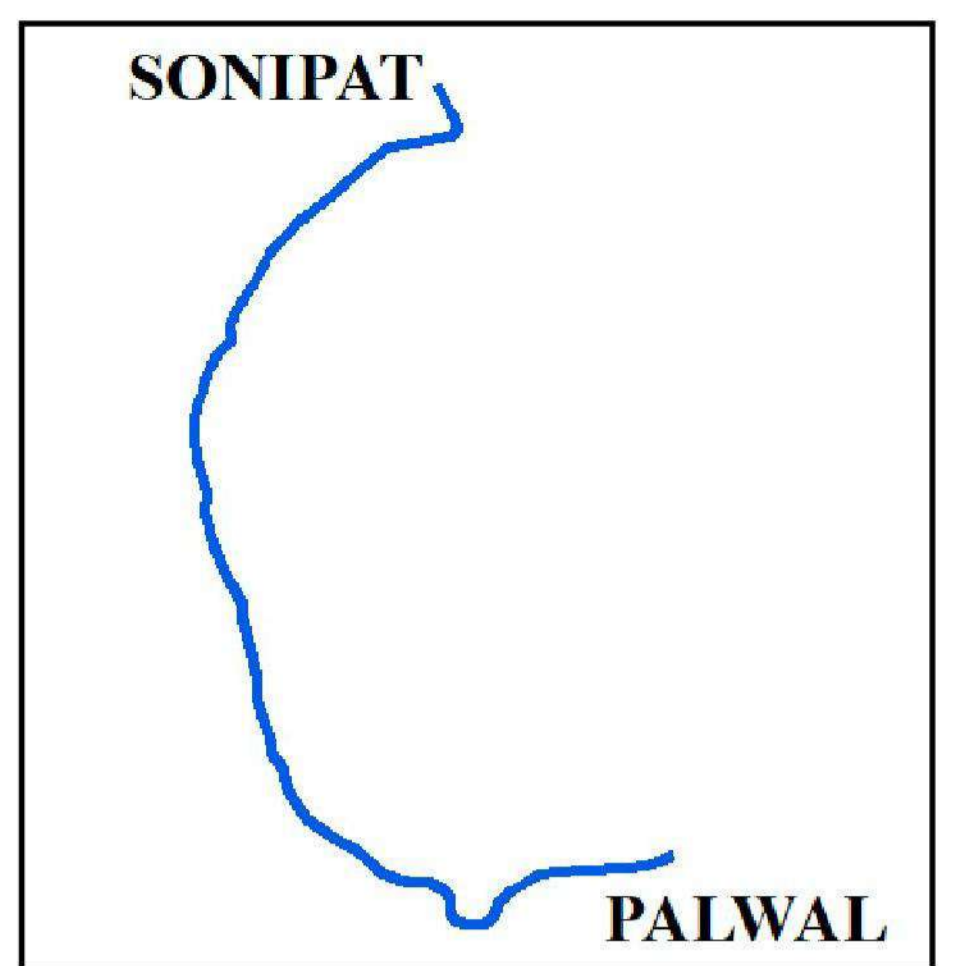
- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

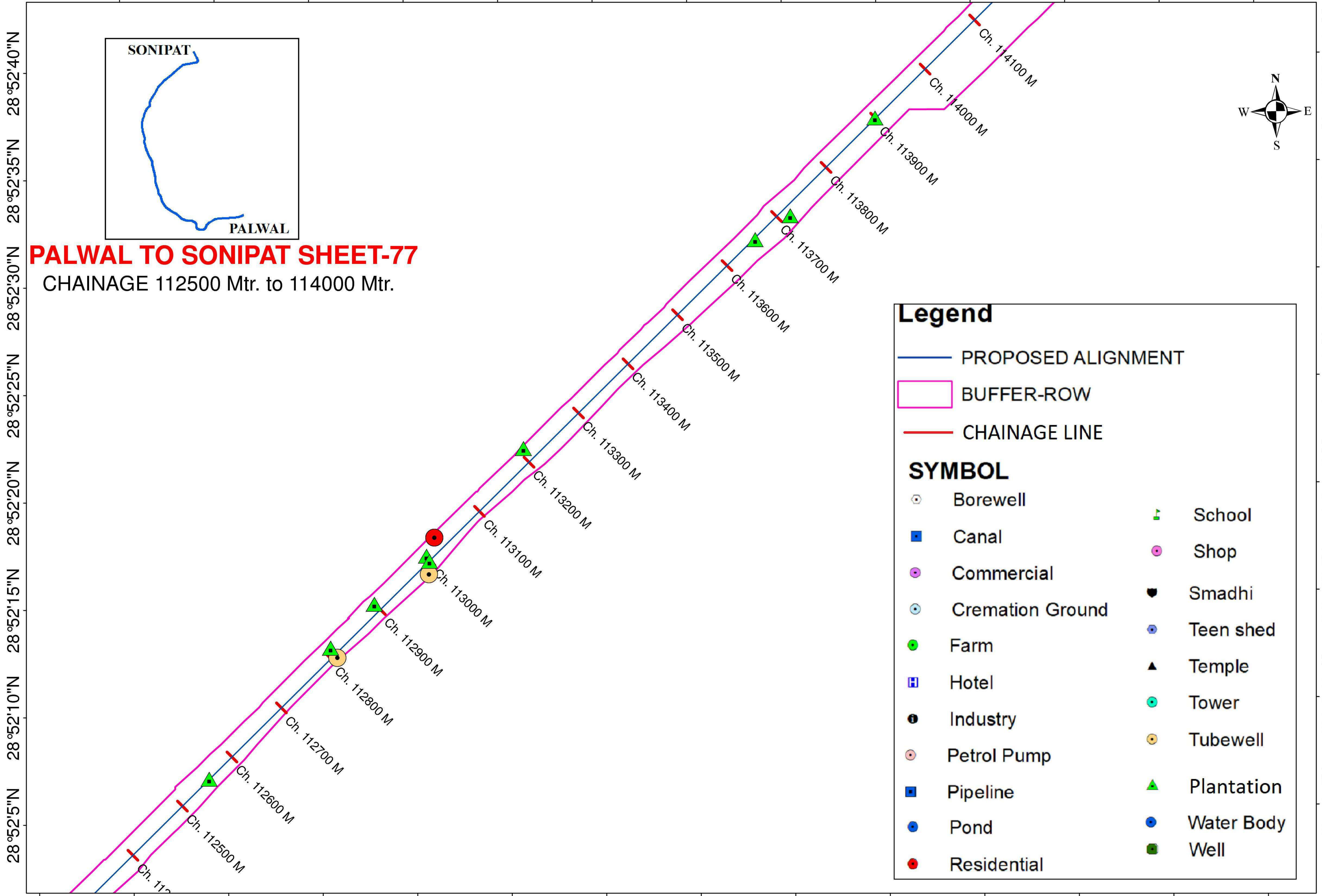
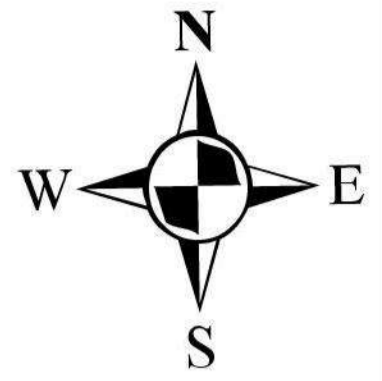
⊙ Borewell	⚡ School
■ Canal	● Shop
● Commercial	⬛ Smadhi
⊙ Cremation Ground	⊙ Teen shed
● Farm	▲ Temple
■ Hotel	⊙ Tower
● Industry	⊙ Tubewell
● Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	



76°57'35"E 76°57'40"E 76°57'45"E 76°57'50"E 76°57'55"E 76°58'0"E 76°58'5"E 76°58'10"E 76°58'15"E 76°58'20"E 76°58'25"E 76°58'30"E 76°58'35"E



PALWAL TO SONIPAT SHEET-77
CHAINAGE 112500 Mtr. to 114000 Mtr.



Legend

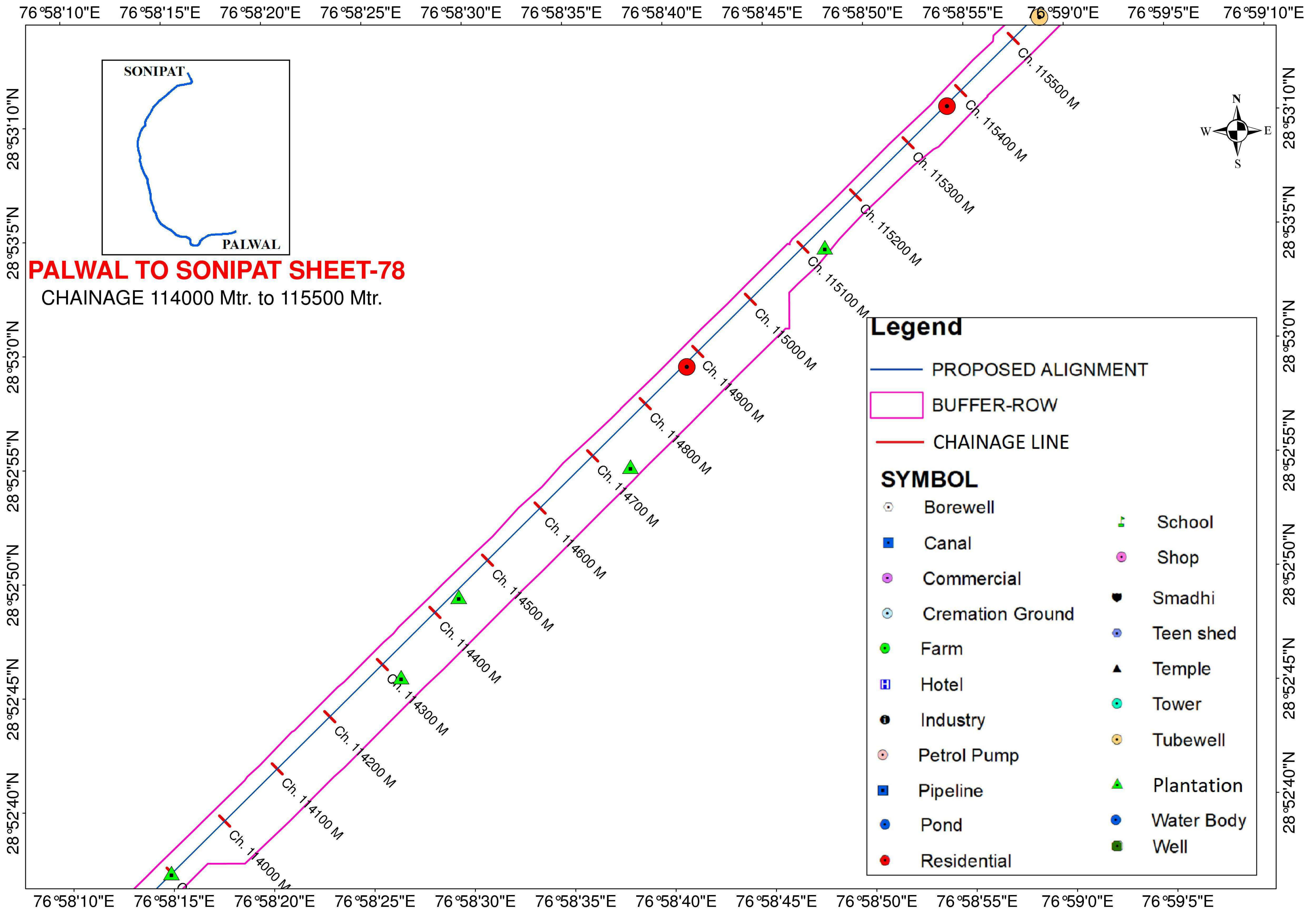
- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

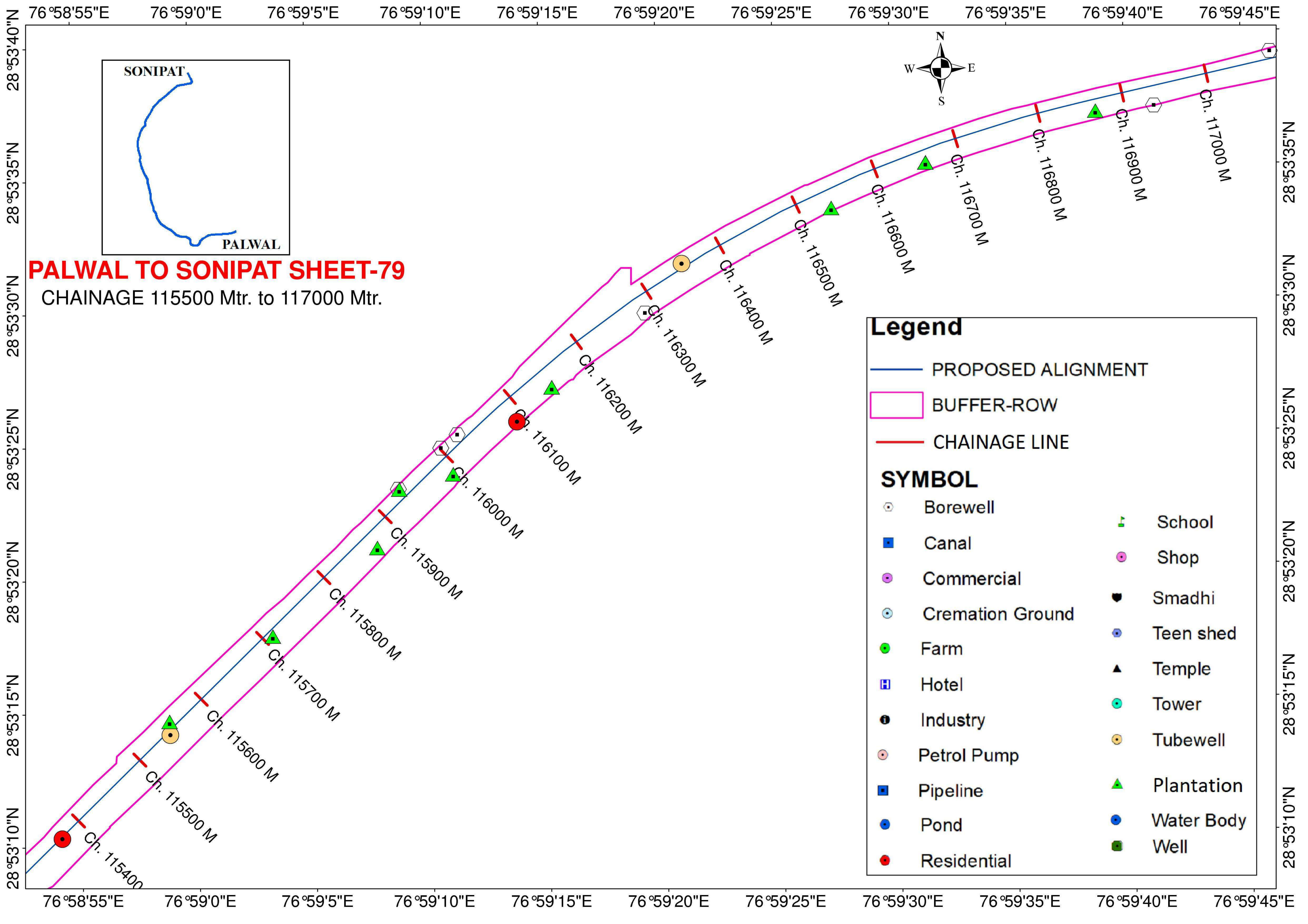
SYMBOL

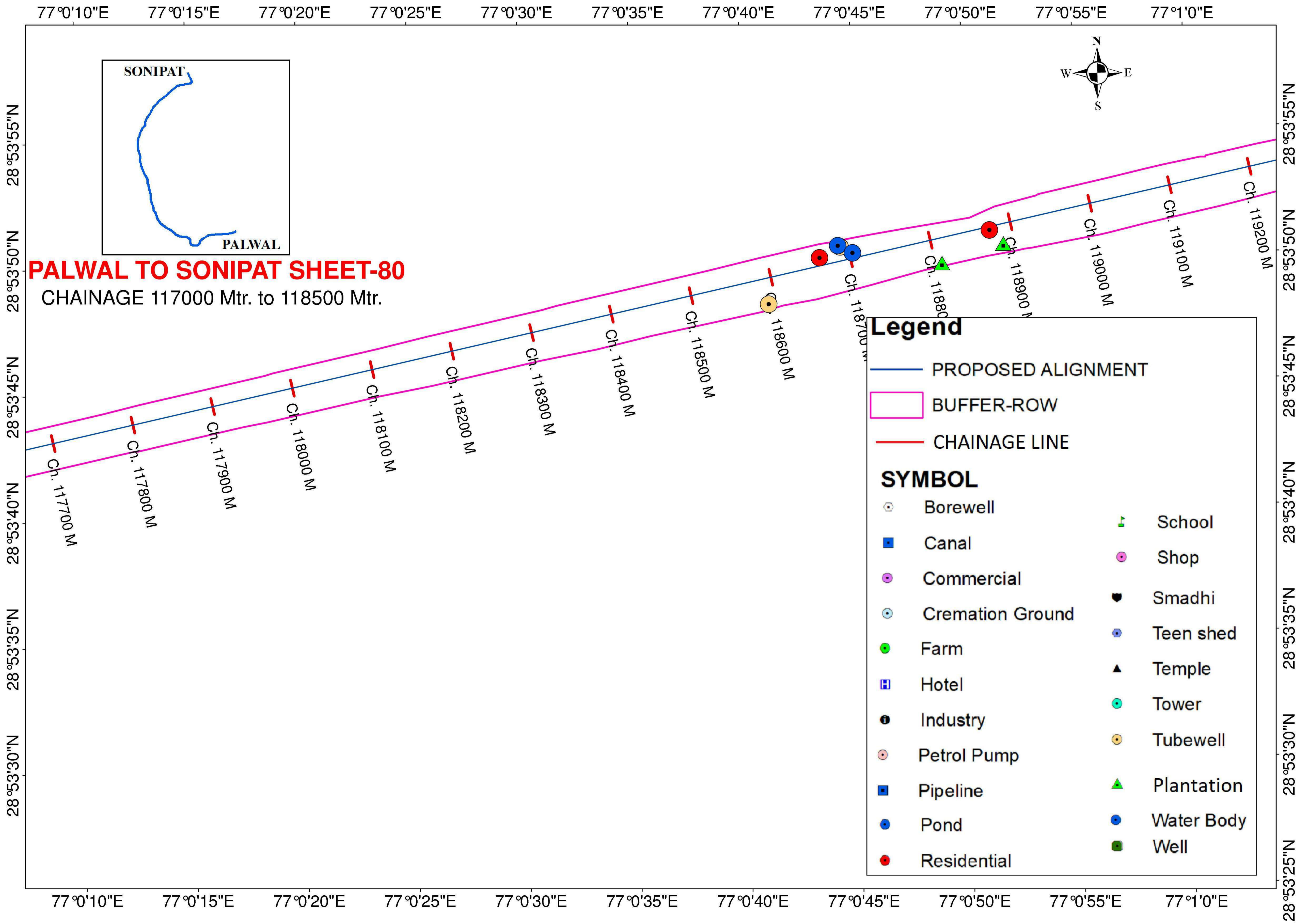
○ Borewell	▲ School
■ Canal	○ Shop
○ Commercial	■ Smadhi
○ Cremation Ground	○ Teen shed
● Farm	▲ Temple
■ Hotel	○ Tower
● Industry	○ Tubewell
○ Petrol Pump	▲ Plantation
■ Pipeline	○ Water Body
● Pond	■ Well
● Residential	

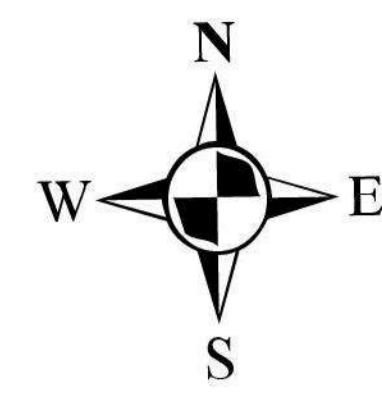
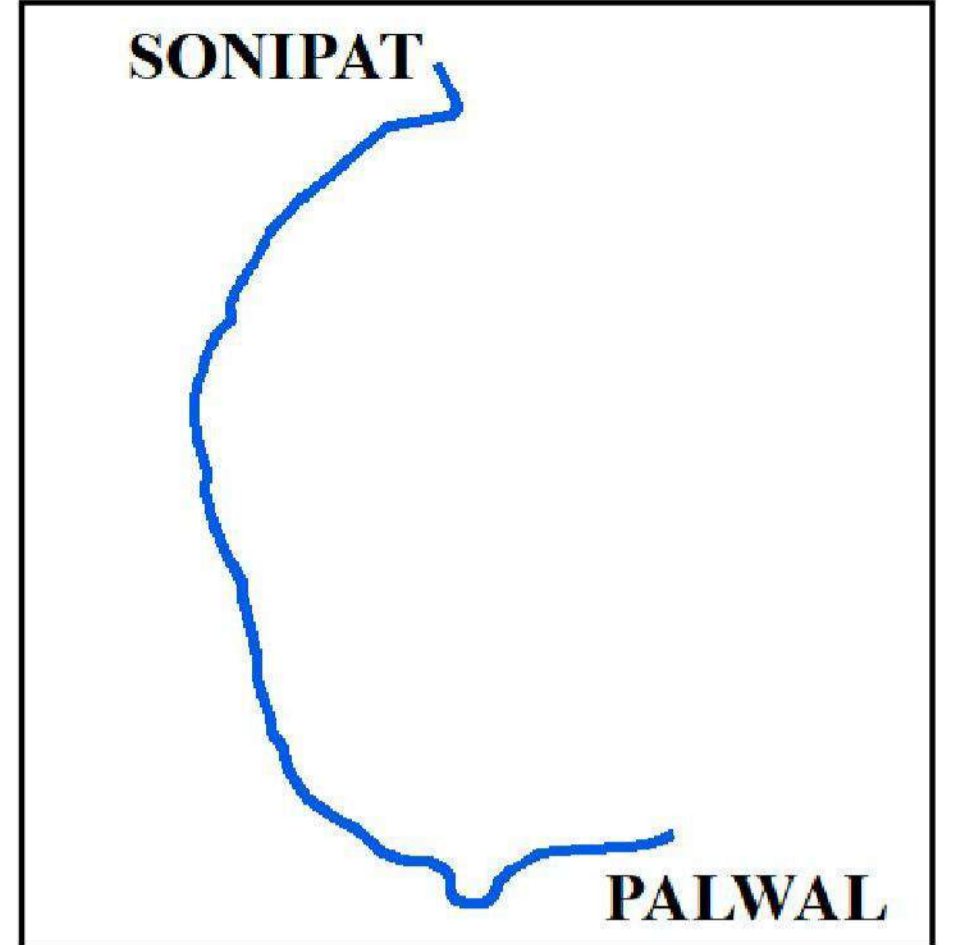
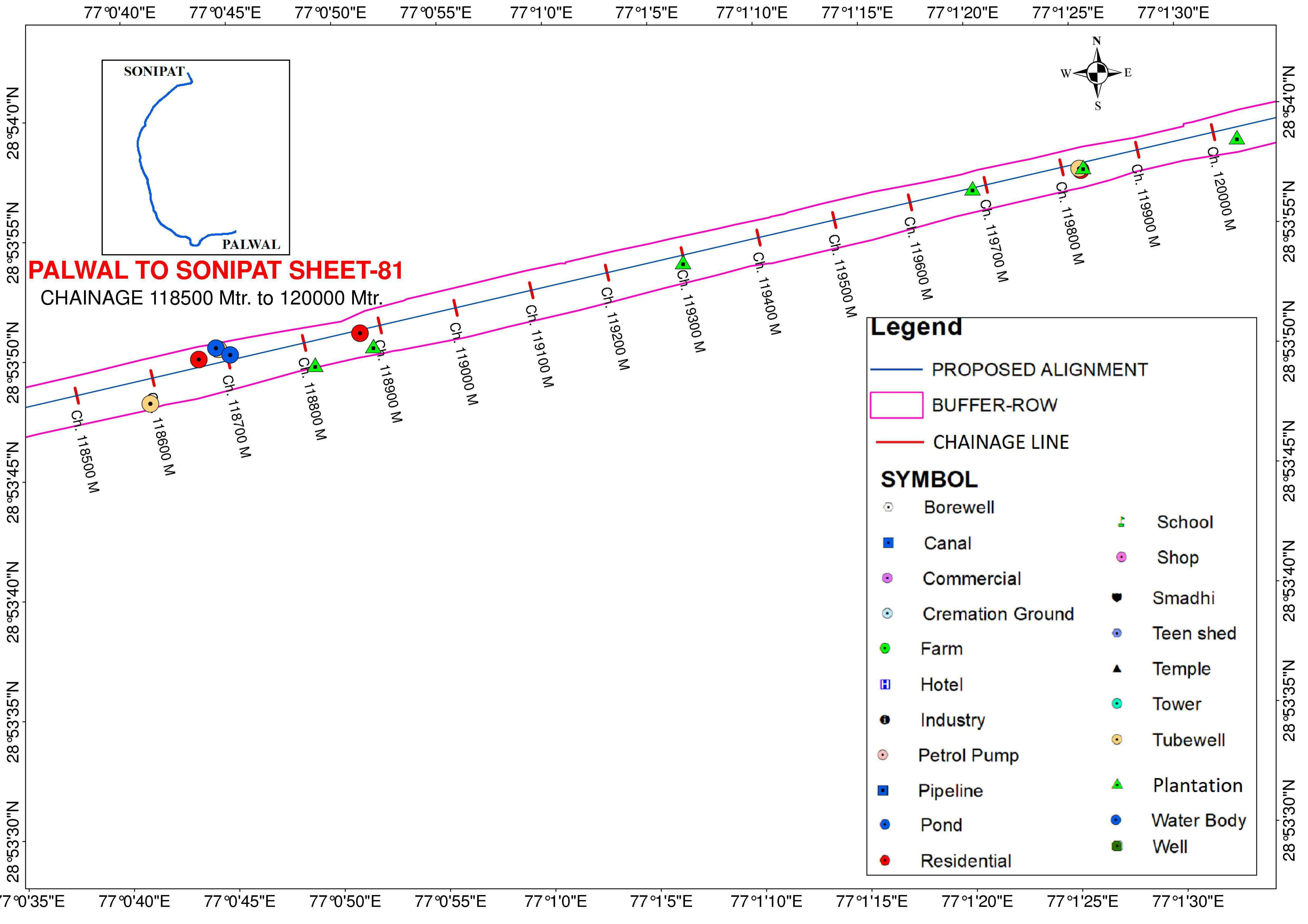
76°57'30"E 76°57'35"E 76°57'40"E 76°57'45"E 76°57'50"E 76°57'55"E 76°58'0"E 76°58'5"E 76°58'10"E 76°58'15"E 76°58'20"E 76°58'25"E 76°58'30"E 76°58'35"E

28°52'5"N 28°52'10"N 28°52'15"N 28°52'20"N 28°52'25"N 28°52'30"N 28°52'35"N 28°52'40"N

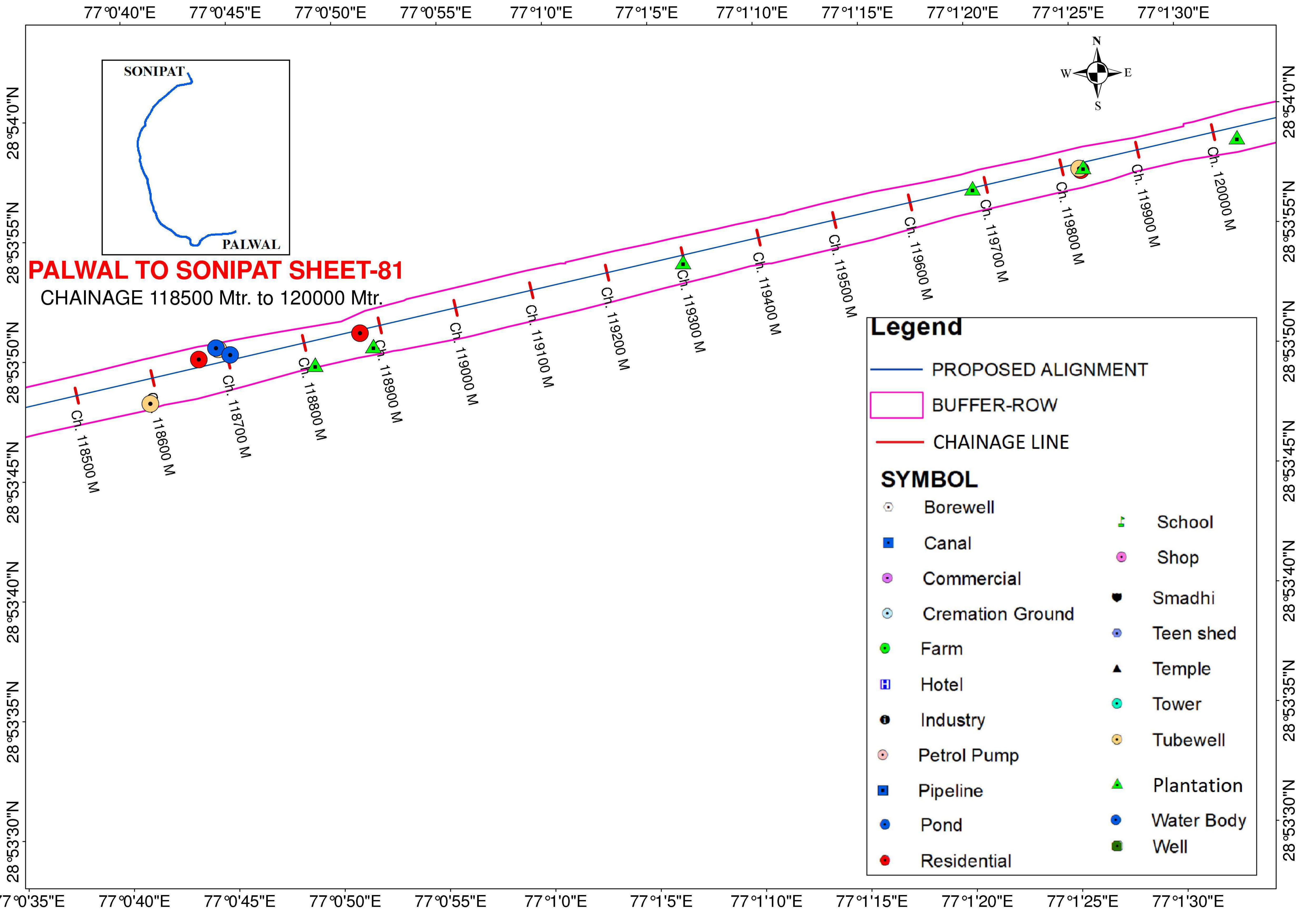


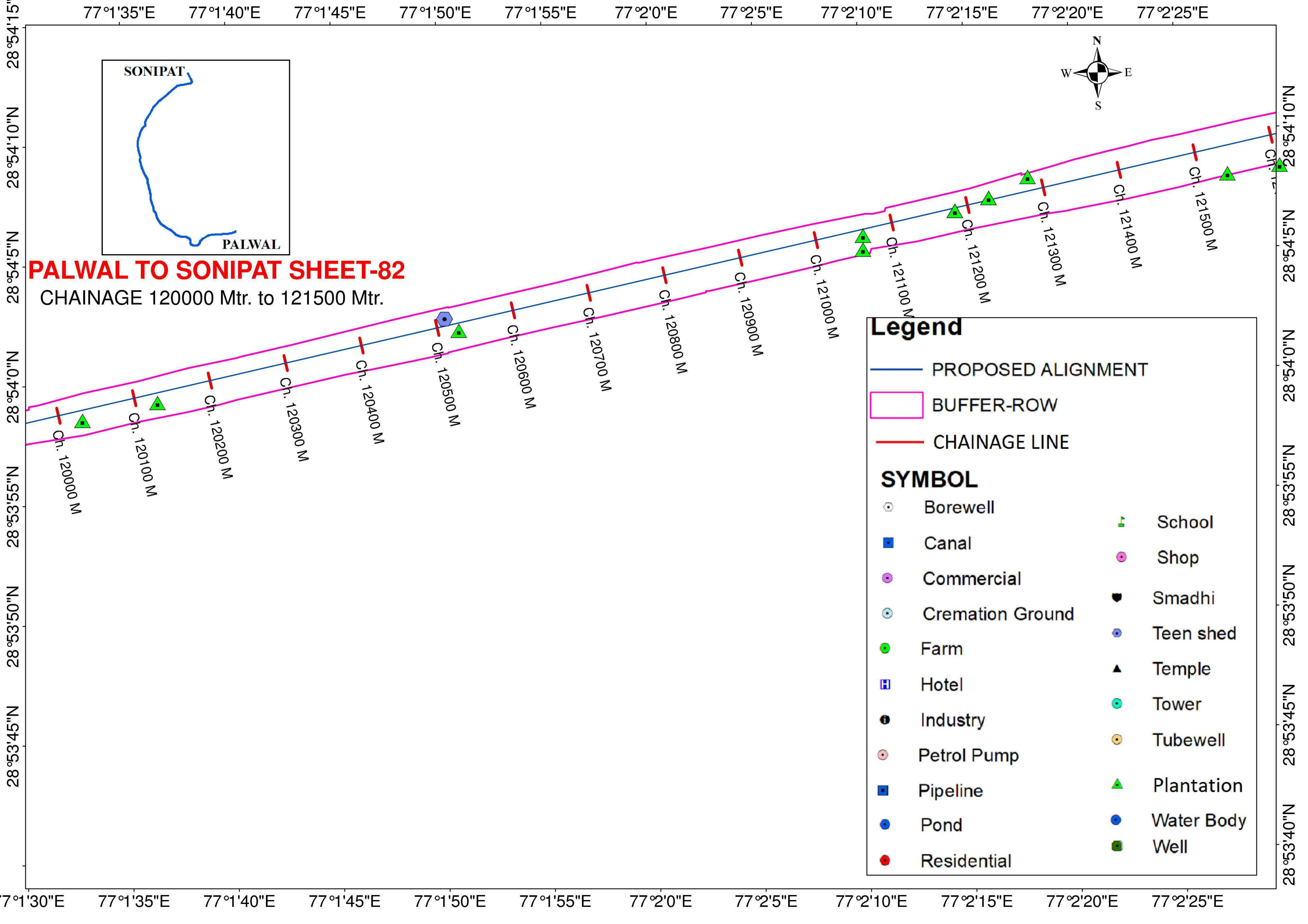


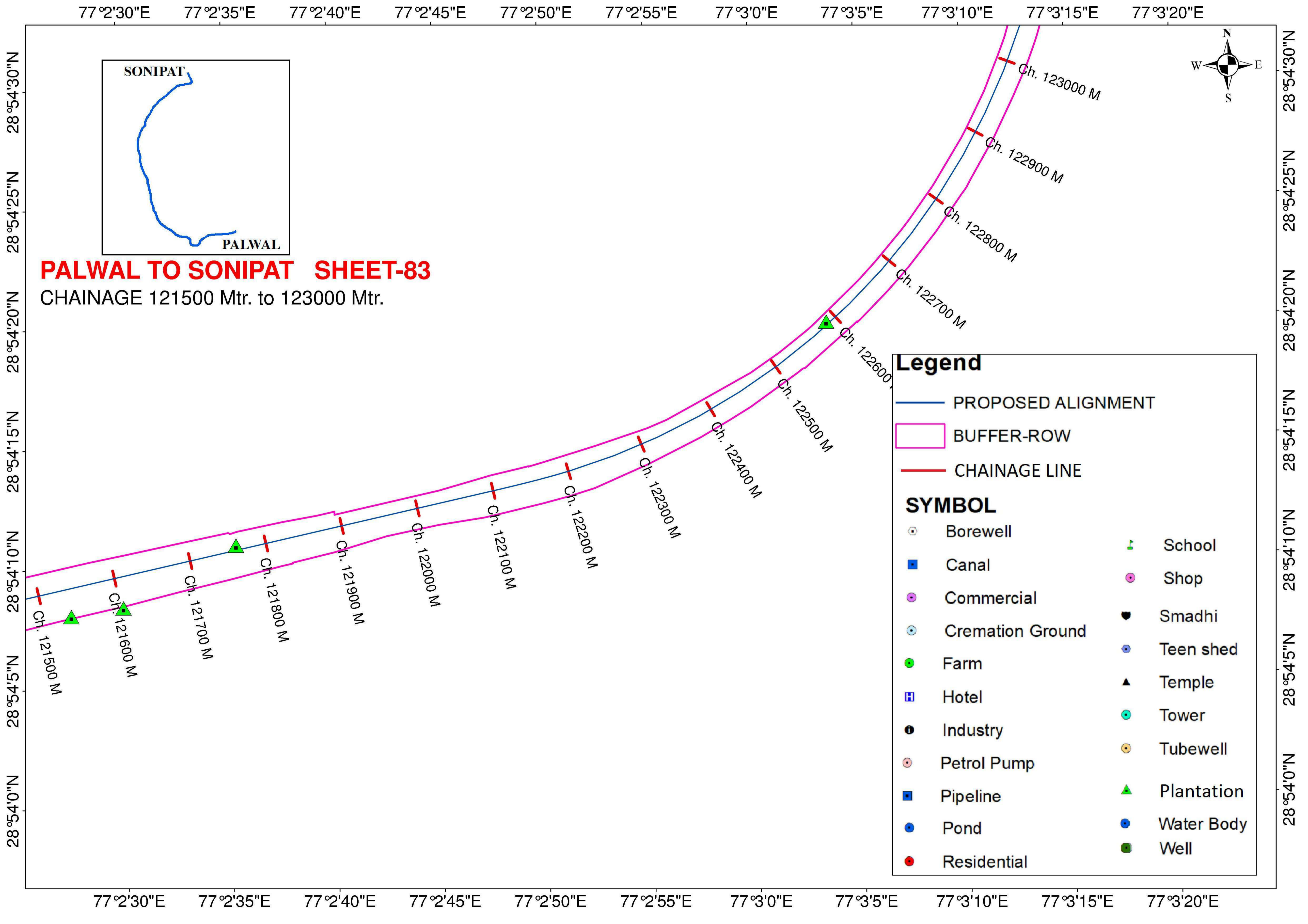


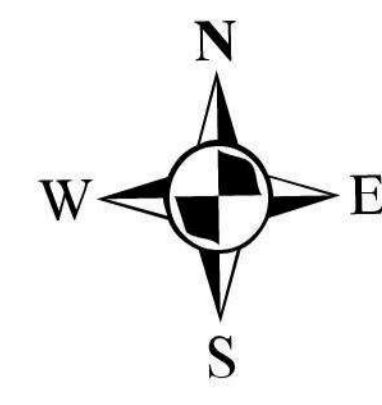
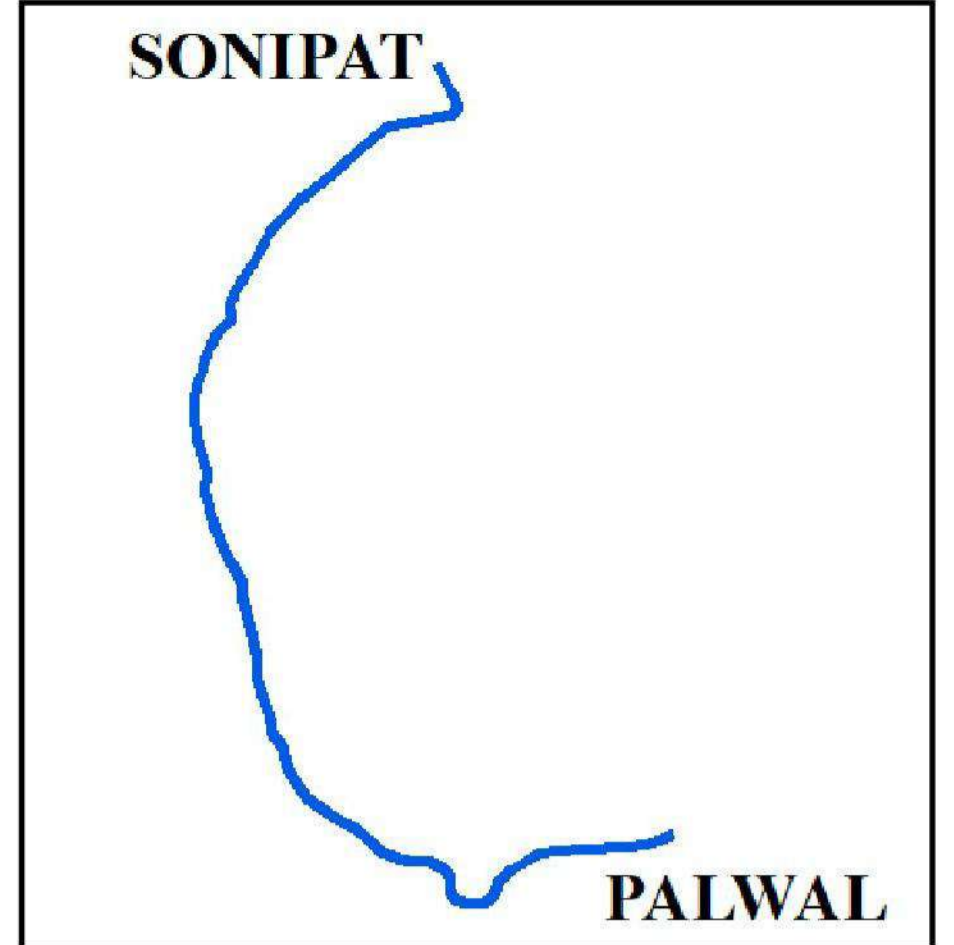
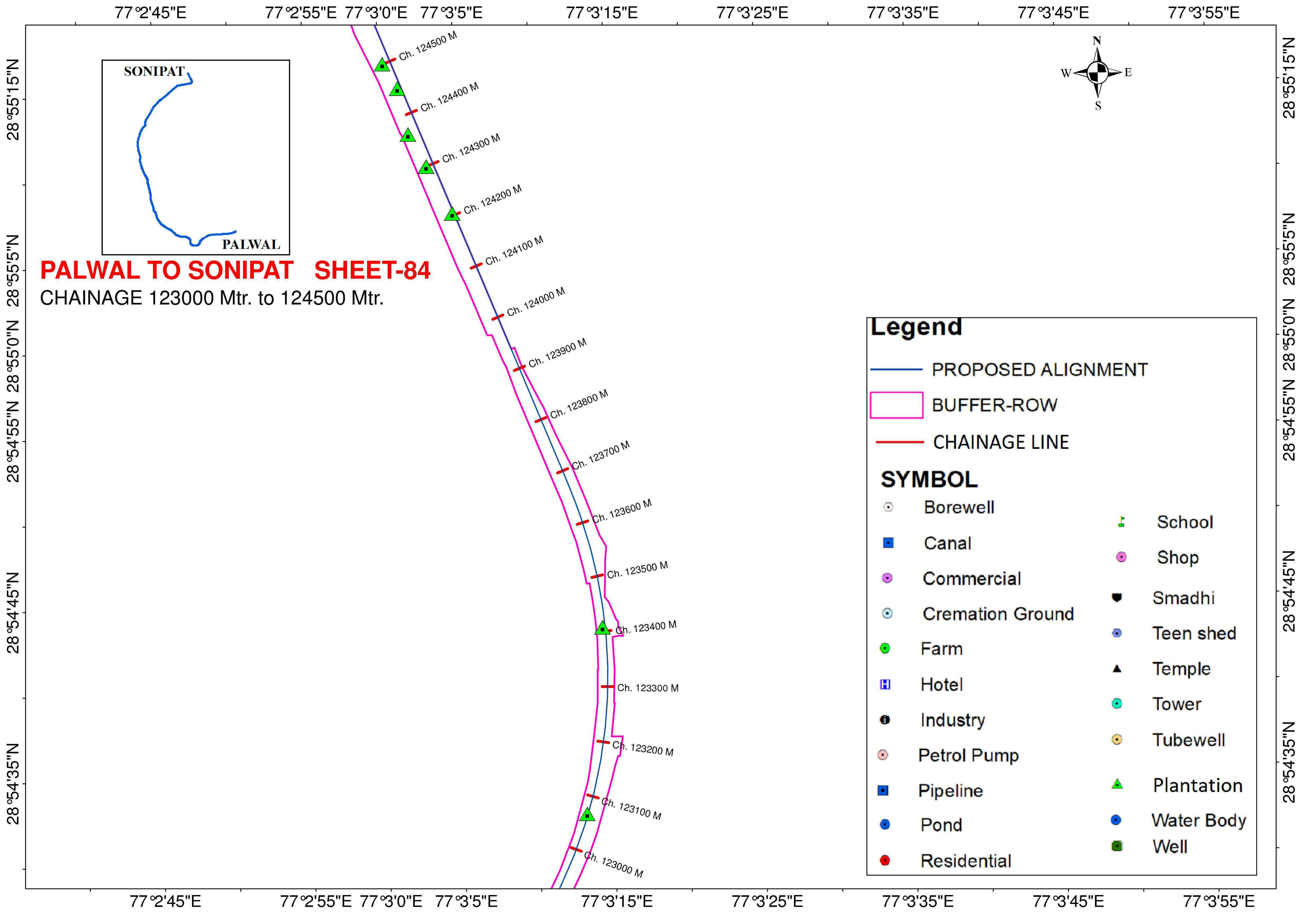


PALWAL TO SONIPAT SHEET-81
CHAINAGE 118500 Mtr. to 120000 Mtr.









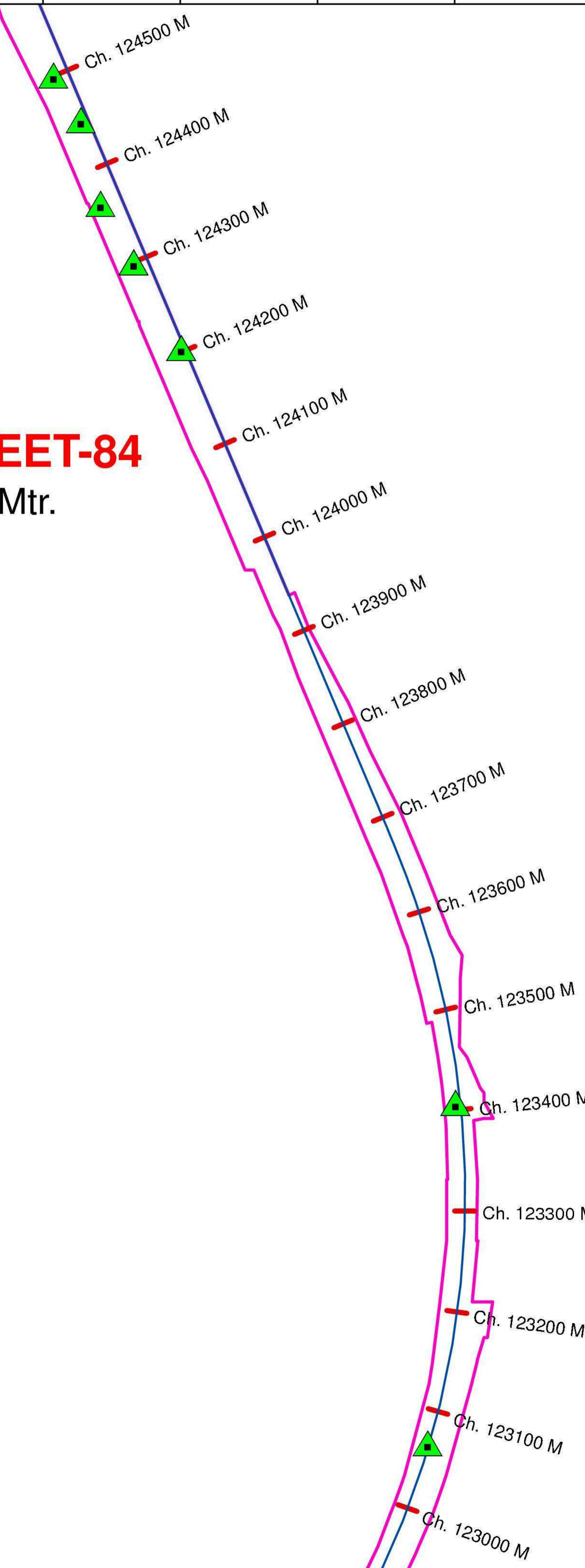
PALWAL TO SONIPAT SHEET-84
 CHAINAGE 123000 Mtr. to 124500 Mtr.

Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

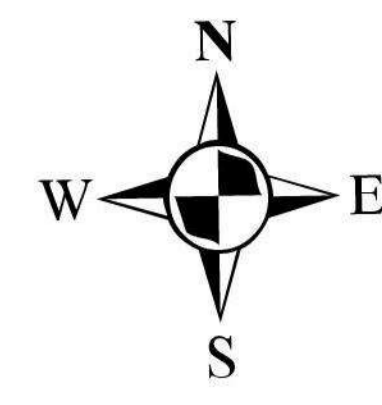
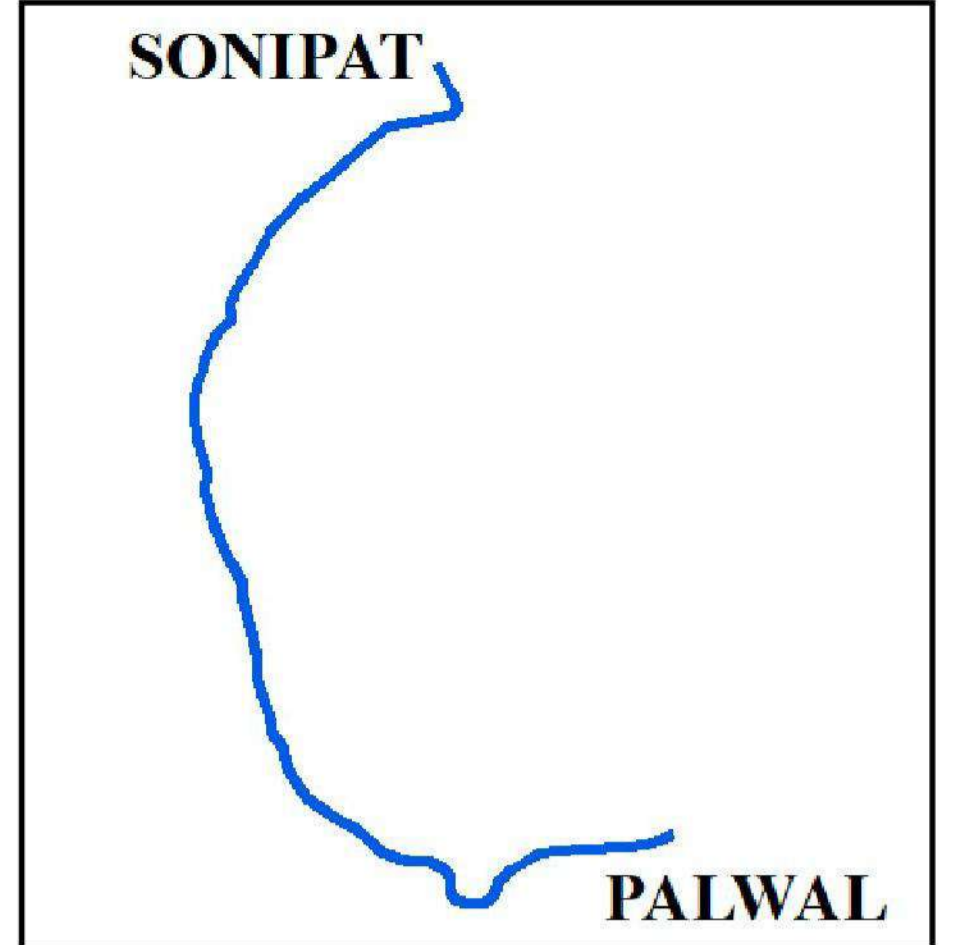
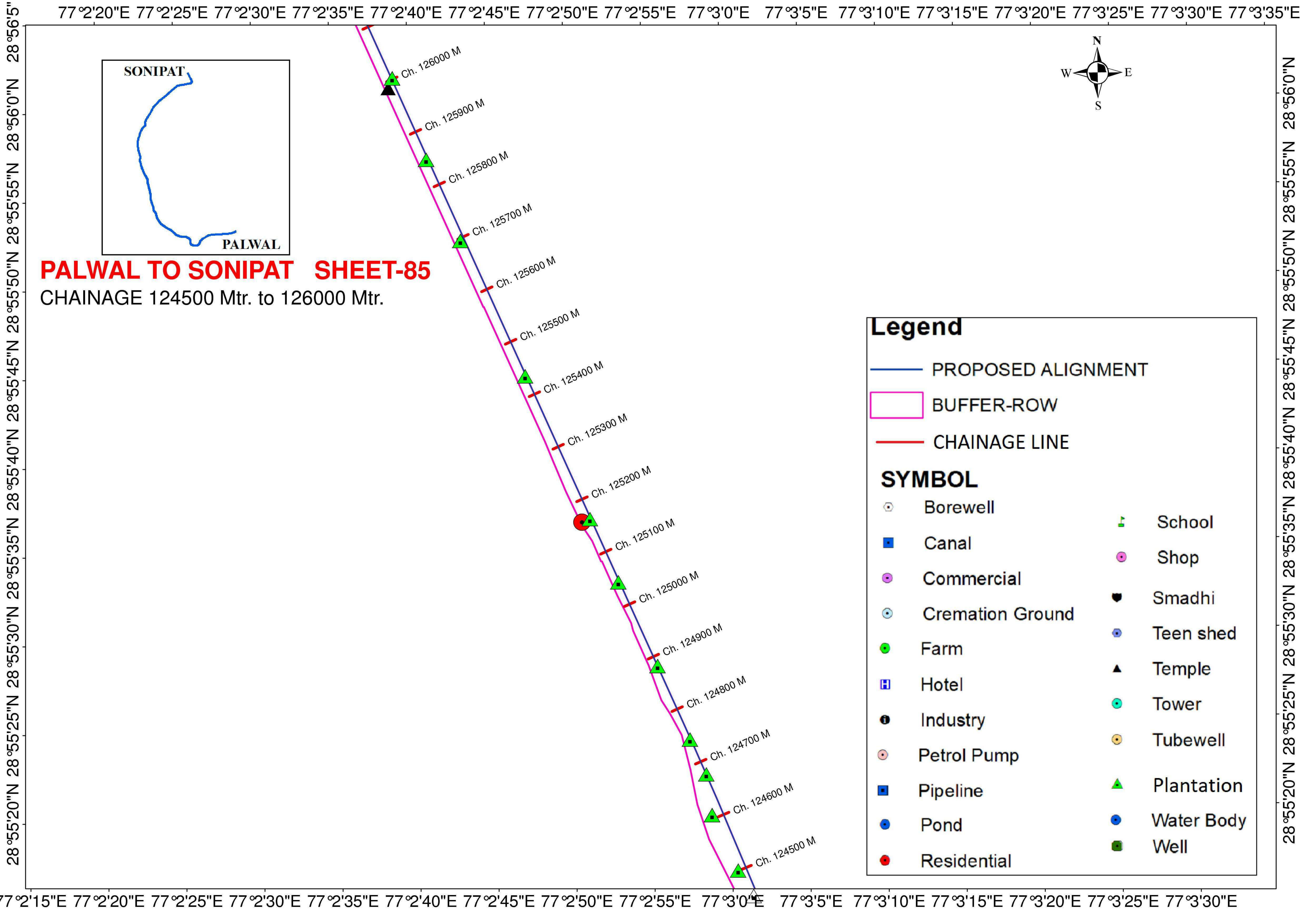
 Borewell	▲ School
■ Canal	 Shop
 Commercial	♣ Smadhi
 Cremation Ground	 Teen shed
● Farm	▲ Temple
 Hotel	 Tower
● Industry	 Tubewell
 Petrol Pump	▲ Plantation
 Pipeline	 Water Body
● Pond	 Well
● Residential	



77°2'45"E 77°2'55"E 77°3'0"E 77°3'5"E 77°3'15"E 77°3'25"E 77°3'35"E 77°3'45"E 77°3'55"E

28°55'15"N
28°55'5"N
28°55'0"N
28°54'55"N
28°54'45"N
28°54'35"N

28°55'15"N
28°55'5"N
28°55'0"N
28°54'55"N
28°54'45"N
28°54'35"N



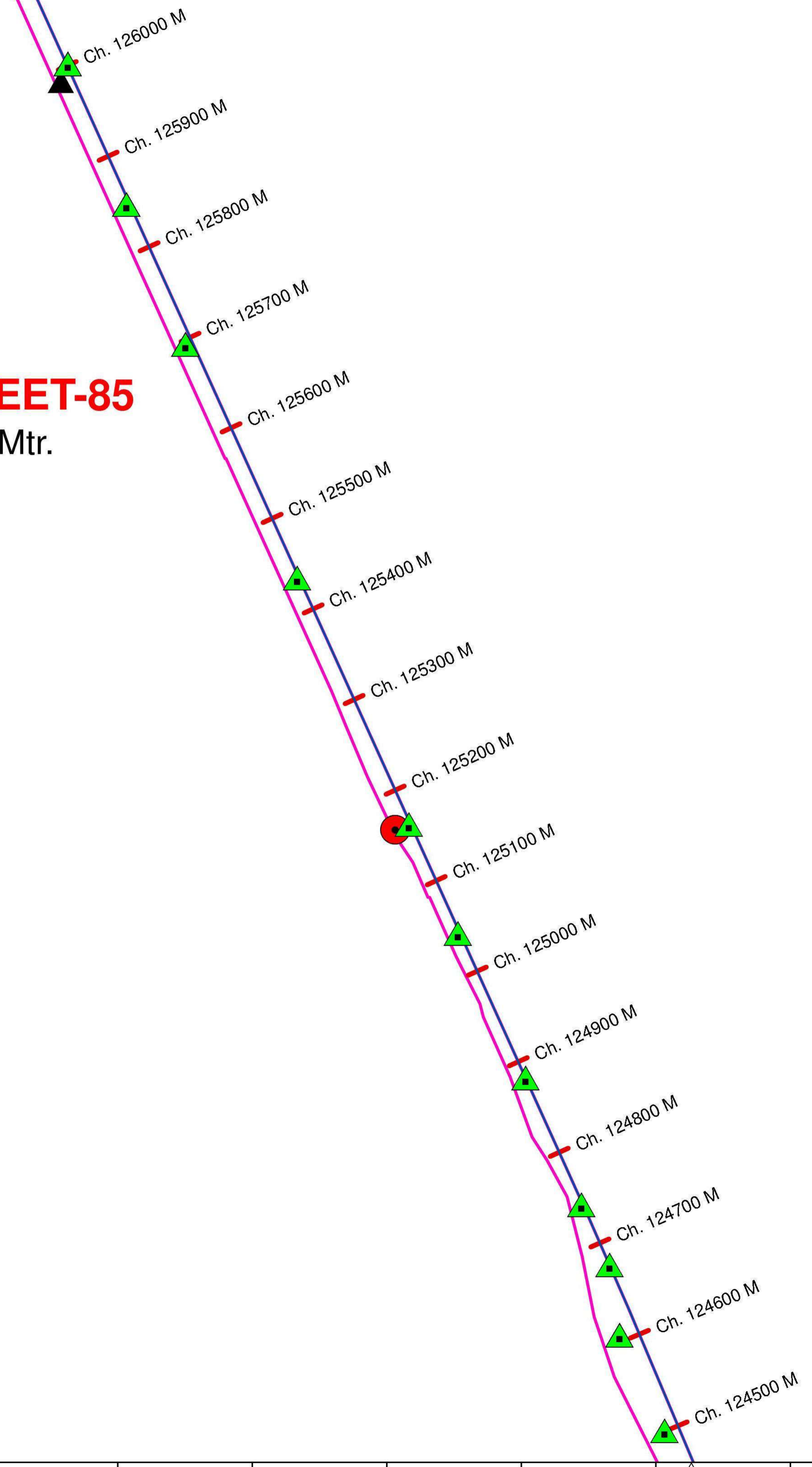
PALWAL TO SONIPAT SHEET-85
 CHAINAGE 124500 Mtr. to 126000 Mtr.

Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

○ Borewell	▲ School
■ Canal	● Shop
○ Commercial	♣ Smadhi
○ Cremation Ground	● Teen shed
● Farm	▲ Temple
■ Hotel	● Tower
● Industry	● Tubewell
○ Petrol Pump	▲ Plantation
■ Pipeline	● Water Body
● Pond	■ Well
● Residential	

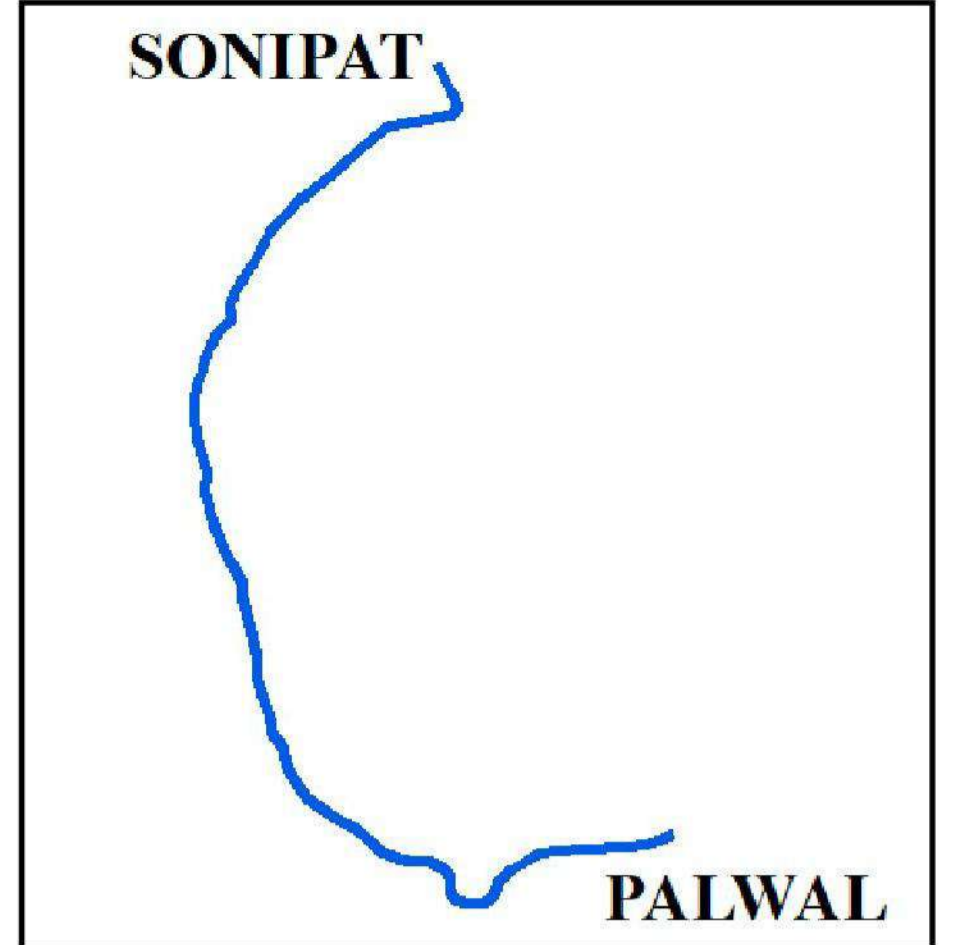
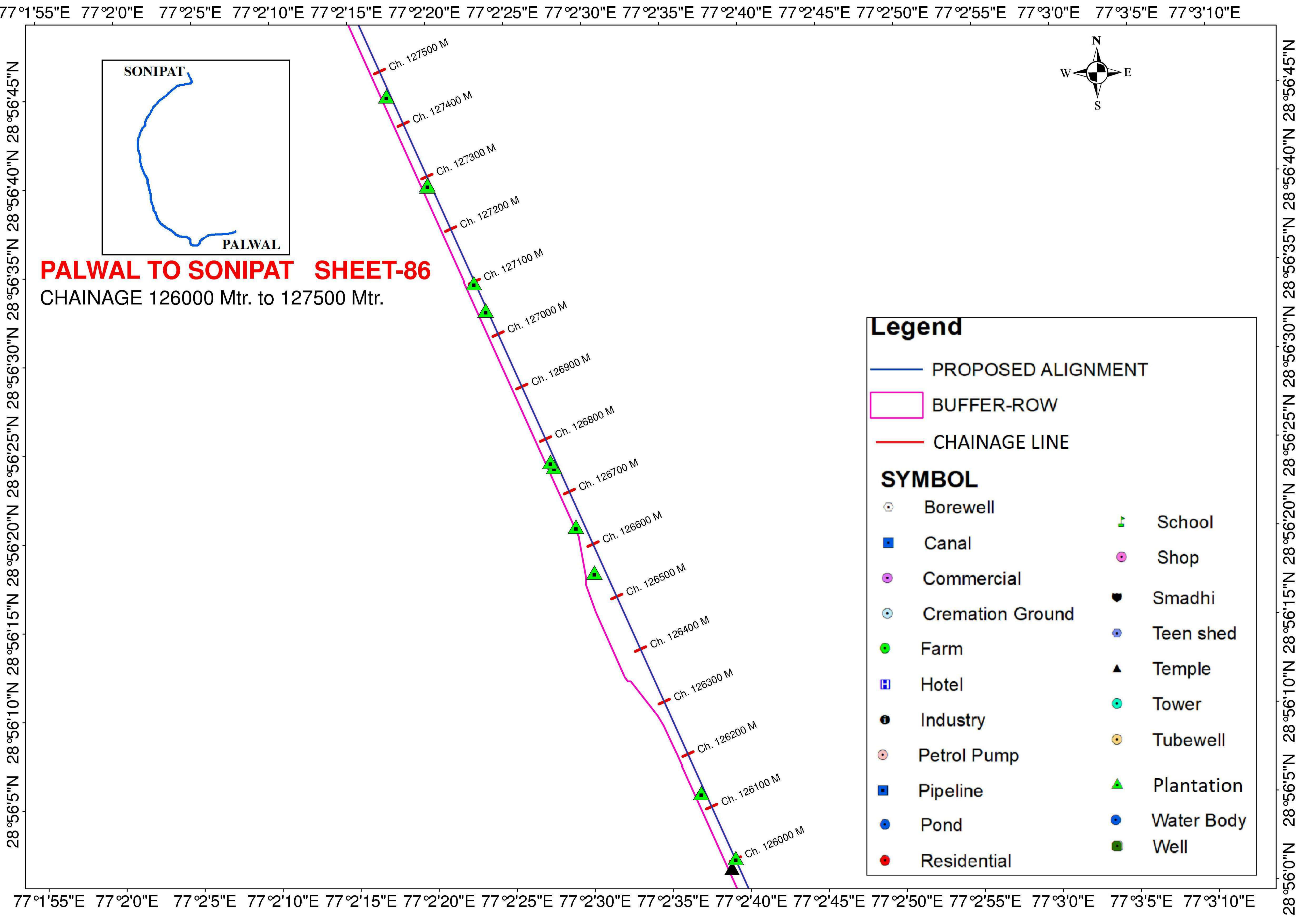


77°2'20"E 77°2'25"E 77°2'30"E 77°2'35"E 77°2'40"E 77°2'45"E 77°2'50"E 77°2'55"E 77°3'0"E 77°3'5"E 77°3'10"E 77°3'15"E 77°3'20"E 77°3'25"E 77°3'30"E 77°3'35"E

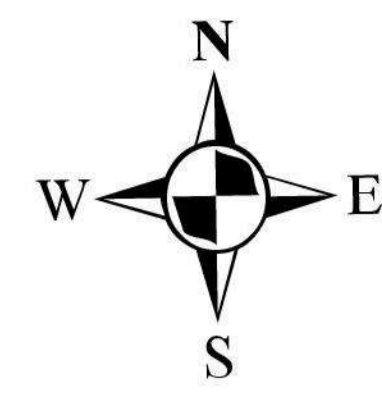
28°55'20"N 28°55'25"N 28°55'30"N 28°55'35"N 28°55'40"N 28°55'45"N 28°55'50"N 28°55'55"N 28°56'0"N

77°2'15"E 77°2'20"E 77°2'25"E 77°2'30"E 77°2'35"E 77°2'40"E 77°2'45"E 77°2'50"E 77°2'55"E 77°3'0"E 77°3'5"E 77°3'10"E 77°3'15"E 77°3'20"E 77°3'25"E 77°3'30"E

28°55'20"N 28°55'25"N 28°55'30"N 28°55'35"N 28°55'40"N 28°55'45"N 28°55'50"N 28°55'55"N 28°56'0"N



PALWAL TO SONIPAT SHEET-86
 CHAINAGE 126000 Mtr. to 127500 Mtr.

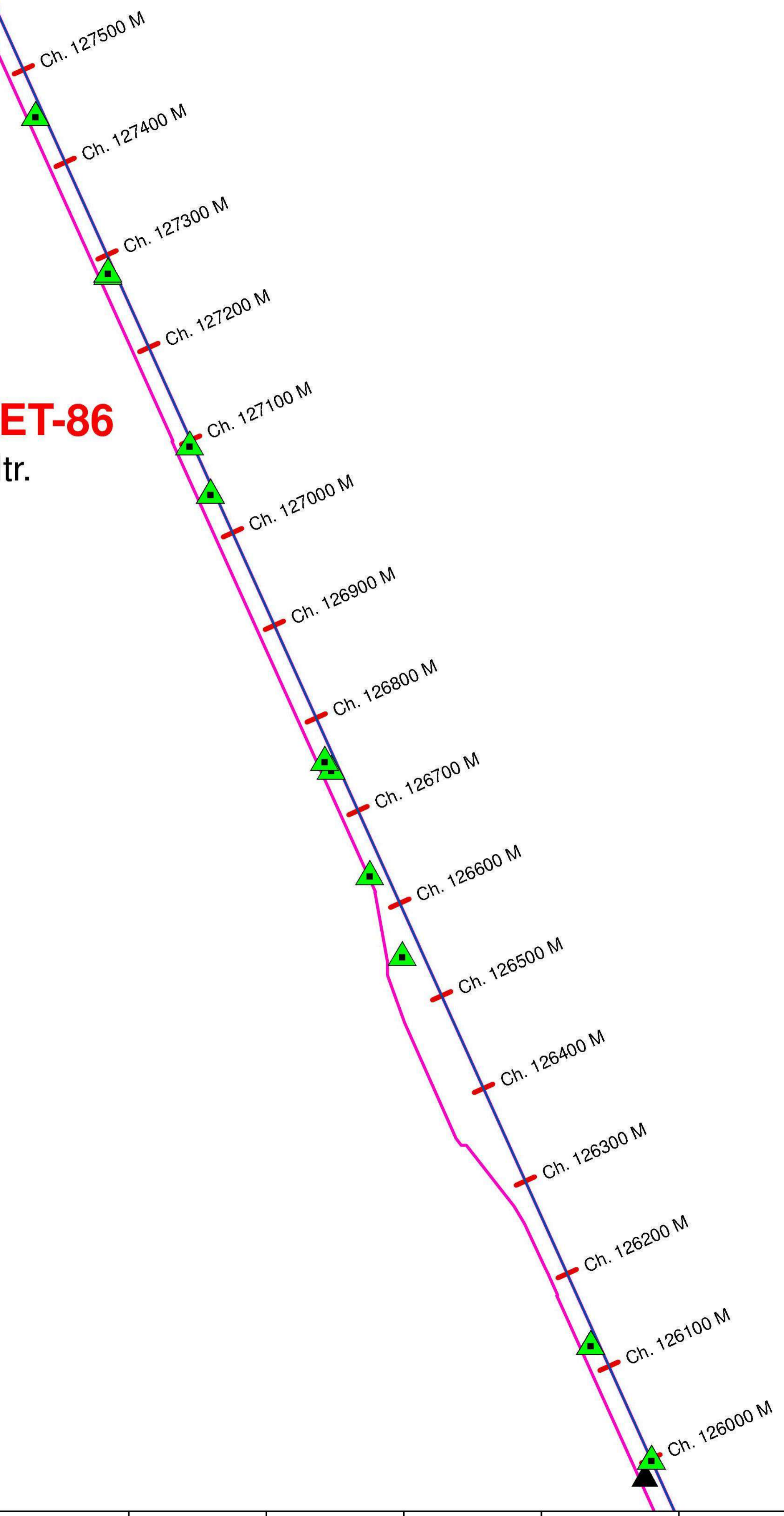


Legend

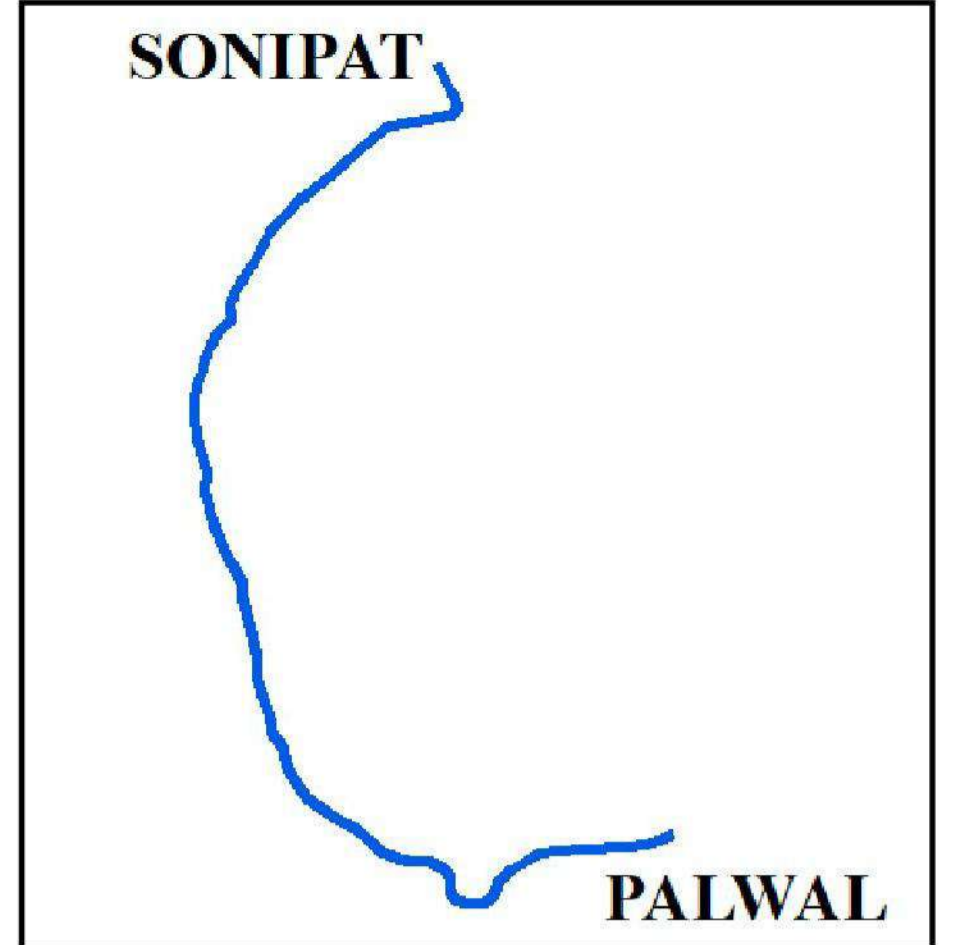
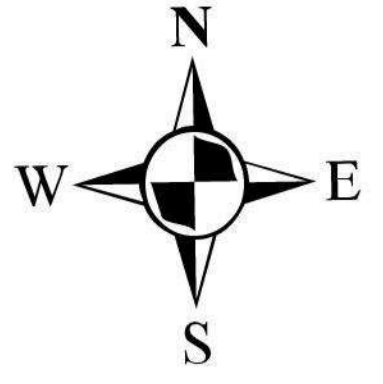
- PROPOSED ALIGNMENT
- BUFFER-ROW
- - - CHAINAGE LINE

SYMBOL

⊙ Borewell	🏫 School
▣ Canal	🏪 Shop
⦿ Commercial	☠ Smadhi
⦿ Cremation Ground	🏠 Teen shed
🌳 Farm	🏛 Temple
🏨 Hotel	🗼 Tower
🏭 Industry	🕯 Tubewell
⛽ Petrol Pump	🌲 Plantation
📡 Pipeline	💧 Water Body
🌊 Pond	🏠 Well
🏠 Residential	



77°1'35"E 77°1'40"E 77°1'45"E 77°1'50"E 77°1'55"E 77°2'0"E 77°2'5"E 77°2'10"E 77°2'15"E 77°2'20"E 77°2'25"E 77°2'30"E 77°2'35"E 77°2'40"E 77°2'45"E 77°2'50"E



PALWAL TO SONIPAT SHEET-87

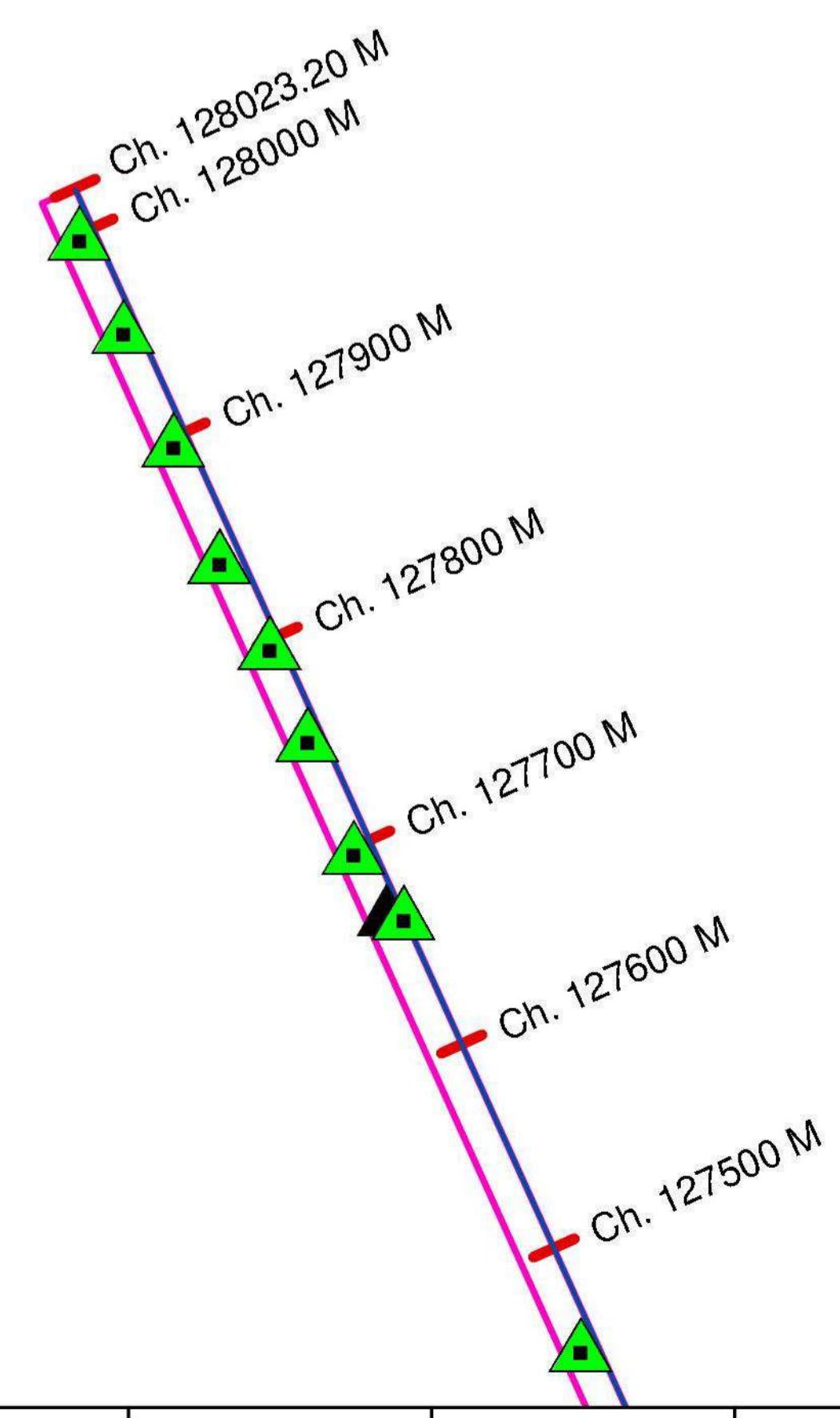
CHAINAGE 127500 Mtr. to 12803.20Mtr.

Legend

- PROPOSED ALIGNMENT
- BUFFER-ROW
- CHAINAGE LINE

SYMBOL

⊙ Borewell	🏫 School
▣ Canal	🏪 Shop
⊙ Commercial	☠ Smadhi
⊙ Cremation Ground	🏠 Teen shed
🌳 Farm	⚡ Temple
🏨 Hotel	🗼 Tower
🏭 Industry	🕒 Tubewell
⊙ Petrol Pump	🌲 Plantation
▣ Pipeline	💧 Water Body
⊙ Pond	🏠 Well
🏠 Residential	



77°1'35"E 77°1'40"E 77°1'45"E 77°1'50"E 77°1'55"E 77°2'0"E 77°2'5"E 77°2'10"E 77°2'15"E 77°2'20"E 77°2'25"E 77°2'30"E 77°2'35"E 77°2'40"E 77°2'45"E 77°2'50"E

28°56'45"N 28°56'50"N 28°56'55"N 28°57'0"N 28°57'5"N 28°57'10"N 28°57'15"N 28°57'20"N 28°57'25"N 28°57'30"N

28°56'50"N 28°56'55"N 28°57'0"N 28°57'5"N 28°57'10"N 28°57'15"N 28°57'20"N 28°57'25"N 28°57'30"N

Annexure 4.4: Lab Report

OVERSEAS TEST HOUSE & RESEARCH CENTRE PVT. LTD.



(An ISO 9001:2008, 14001:2004, OHSAS 18001:2007 Certified & NABL Accredited Laboratory)

Regd. Address: 501, 5th Floor, Apex Tower, Tonk Road, Jaipur-302015,

Tel: +91-141-2744509, (O), Mobile: +91-9460221084, E-mail: arun.omtc@gmail.com



Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana				
2.	Monitoring Period: DECEMBER20 TO February 21	3.	Sampling Location: New Parthala Rly station		
4.	Sample Drawn By: OTH&RC Team	5.	Reporting Date:- 10/03/2021		
6.	Test Requirement: PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ & CO	7.	Season- WINTER		

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	Co(mg/m ³)
1.	02-03/12/2020	81.66	51.78	37.94	6.50	2.2
2.	03-04/12/2020	82.72	52.94	35.62	5.72	2.4
3.	09-10/12/2020	83.68	50.64	35.45	7.42	2.8
4.	10-11/12/2020	84.34	50.94	36.35	7.34	2.2
5.	16-17/12/2020	83.36	51.64	37.42	6.52	2.6
6.	17-18/12/2020	81.38	51.26	35.64	5.62	2.0
7.	24-25/12/2020	83.34	54.94	36.38	6.82	2.4
8.	25-26/12/2020	81.42	55.97	35.38	7.52	2.2
9.	01-02/01/2021	82.34	53.24	34.56	7.24	2.8
10.	02-03/01/2021	80.26	54.88	36.28	6.12	2.4
11.	08-09/01/2021	83.64	52.42	37.42	7.42	1.8
12.	09-10/01/2021	82.92	51.82	35.46	7.84	2.0
13.	15-16/01/2021	81.24	55.64	34.28	6.28	2.4
14.	16-17/01/2021	82.64	52.34	34.82	5.72	2.2
15.	22-23/01/2021	83.92	54.24	36.24	6.46	2.6
16.	23-24/01/2021	82.34	51.48	34.82	5.88	2.4
17.	01-02/02/2021	82.32	50.48	37.42	5.64	2.2
18.	02-03/02/2021	83.42	51.42	34.28	5.42	2.8
19.	08-09/02/2021	83.66	52.34	34.82	6.48	2.4
20.	09-10/02/2021	82.42	52.46	35.42	6.54	2.2
21.	15-16/02/2021	83.44	54.28	36.58	6.48	1.8
22.	16-17/02/2021	82.42	52.34	36.42	7.14	1.6
23.	22-23/02/2021	82.48	53.28	35.24	7.28	1.8
24.	23-24/02/2021	84.34	53.28	34.28	7.26	2.2
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)



Analyst:

Authorized Signatory:

JAS-ANZ



Address: 19A, Shivpuri Colony Extension, Jeen Mata Marg, Jhotwara, Jaipur – 302015

Tel: +91-141-2466766, E-mail: overseastesthouse@gmail.com,



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Certificate No.: TC-5165

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 - 2) Re analysis of sample will be done, if requested within 15 days from the date of Reporting of sample if the samples are not consumed during analysis.
 - 3) All disputes subject to Jaipur Jurisdiction and our liability is limited to invoiced value only.



JAS-ANZ



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Tel: +91-141-2744509, (O), Mobile: +91-9460221084, E-mail: arun.omtc@gmail.com



Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana	
2.	Monitoring Period: DECEMBER 20 TO FEBRUARY 21	3. Sampling Location:- Near Sultanpur village
4.	Sample Drawn By: OTH&RC Team	5. Reporting Date:- 10/03/2021
6.	Test Requirement: PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ & CO	7. Season- WINTER

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	Co(mg/m ³)
1.	02-03/12/2020	87.16	52.52	10.36	4.22	2.4
2.	03-04/12/2020	86.48	52.56	11.54	5.54	2.6
3.	09-10/12/2020	88.64	51.62	10.76	5.42	2.4
4.	10-11/12/2020	87.56	51.52	11.08	4.58	2.2
5.	16-17/12/2020	88.72	51.62	10.88	5.14	2.4
6.	17-18/12/2020	87.64	50.62	11.56	4.62	2.6
7.	24-25/12/2020	86.66	51.34	10.16	4.58	2.8
8.	25-26/12/2020	87.34	51.62	11.56	4.84	2.4
9.	01-02/01/2021	86.42	53.24	12.34	4.82	2.5
10.	02-03/01/2021	85.48	54.82	10.26	5.56	2.4
11.	08-09/01/2021	83.24	53.26	11.32	5.84	2.2
12.	09-10/01/2021	86.24	54.28	11.64	5.48	2.6
13.	15-16/01/2021	84.56	54.22	11.36	5.84	2.2
14.	16-17/01/2021	85.42	55.64	10.46	6.42	2.8
15.	22-23/01/2021	86.32	53.34	10.32	5.84	2.6
16.	23-24/01/2021	84.24	53.24	11.34	5.48	2.4
17.	01-02/02/2021	88.64	54.28	11.32	5.62	2.5
18.	02-03/02/2021	87.56	54.24	11.34	4.58	2.4
19.	08-09/02/2021	86.54	52.48	10.32	4.26	2.6
20.	09-10/02/2021	88.24	54.28	12.34	5.62	2.4
21.	15-16/02/2021	87.56	52.34	11.42	5.42	2.2
22.	16-17/02/2021	86.54	54.28	11.40	5.46	2.6
23.	22-23/02/2021	88.32	54.28	12.12	5.24	2.8
24.	23-24/02/2021	86.94	55.24	11.24	5.42	2.9
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)



Address: 19A, Shivpuri Colony Extension, Jeen Mata Marg, Jhotwara, Jaipur – 302015
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Certificate No.: TC-5165



Analyst:

Authorized Signatory:

- NOTE :
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Tel: +91-141-2744509, (O), Mobile: +91-9460221084, E-mail: arun.omtc@gmail.com



Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Monitoring Period: DECEMBER 20TO FEBRUARY21	3.	Sampling Location:- Fazalwas Village
4.	Sample Drawn By: OTH&RC Team	5.	Reporting Date:- 10/03/2021
6.	Test Requirement:PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ & CO	7.	Season- WINTER

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	Co(mg/m ³)
1.	02-03/12/2020	77.08	49.82	11.26	5.62	1.8
2.	03-04/12/2020	76.98	52.34	10.24	6.82	1.6
3.	09-10/12/2020	78.54	48.26	9.82	5.42	2.2
4.	10-11/12/2020	77.26	46.58	12.42	4.62	1.6
5.	16-17/12/2020	78.12	44.62	10.84	3.24	2.4
6.	17-18/12/2020	77.94	45.62	13.24	5.21	2.2
7.	24-25/12/2020	76.36	46.28	10.18	6.24	2.4
8.	25-26/12/2020	77.24	48.56	11.18	5.46	2.2
9.	01-02/01/2021	72.34	46.24	10.24	5.46	2.0
10.	02-03/01/2021	77.22	47.28	11.34	5.62	1.8
11.	08-09/01/2021	76.56	44.66	9.92	4.62	1.6
12.	09-10/01/2021	75.64	45.28	11.24	4.66	2.0
13.	15-16/01/2021	76.92	46.28	10.32	4.72	1.4
14.	16-17/01/2021	74.56	47.62	11.24	4.78	1.6
15.	22-23/01/2021	78.62	46.28	11.12	5.12	1.8
16.	23-24/01/2021	73.24	48.28	11.46	5.16	2.0
17.	01-02/02/2021	74.56	49.28	10.94	5.42	2.2
18.	02-03/02/2021	75.64	47.24	11.24	5.64	2.4
19.	08-09/02/2021	77.84	46.28	10.96	4.88	2.1
20.	09-10/02/2021	76.52	46.22	10.88	4.82	1.8
21.	15-16/02/2021	74.62	47.26	11.34	4.22	2.4
22.	16-17/02/2021	76.34	47.62	11.37	4.22	2.2
23.	22-23/02/2021	74.56	46.28	11.84	4.30	2.0
24.	23-24/02/2021	74.64	47.26	11.88	4.26	2.4
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)

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Certificate No.: TC-5165

Analyst:



Authorized Signatory:

- NOTE :
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Tel: +91-141-2744509, (O), Mobile: +91-9460221084, E-mail: arun.omtc@gmail.com



Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Monitoring Period: DECEMBER 2020To FEBRUARY21	3.	Sampling Location: - Manesar Town
4.	Sample Drawn By: OTH&RC Team	5.	Reporting Date:- 10/03/2021
6.	Test Requirement: PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , & CO	7.	Season- Winter

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	CO (mg/m ³)
1.	04-05/12/2020	98.34	58.62	13.09	7.66	2.4
2.	05-06/12/2020	96.72	56.56	12.20	7.46	2.2
3.	11-12/12/2020	91.26	56.84	13.24	7.52	2.6
4.	12-13/12/2020	90.52	57.32	14.14	7.42	2.0
5.	18-19/12/2020	93.08	57.82	13.88	8.16	2.8
6.	19-20/12/2020	88.62	56.92	12.92	6.52	2.2
7.	26-27/12/2020	92.90	56.88	13.82	5.62	1.8
8.	27-28/12/2020	94.04	56.22	14.72	6.58	2.0
9.	04-05/01/2021	92.34	54.24	13.25	7.24	2.2
10.	05-06/01/2021	92.45	54.32	14.26	6.22	2.4
11.	11-12/01/2021	94.28	56.24	13.26	6.24	2.6
12.	12-13/01/2021	88.34	54.26	13.24	7.12	2.8
13.	18-19/01/2021	86.34	54.28	13.22	6.96	2.4
14.	19-20/01/2021	90.24	55.62	14.24	6.24	2.2
15.	26-27/01/2021	92.42	56.28	15.26	6.34	2.4
16.	27-28/01/2021	94.27	54.24	14.28	7.12	2.6
17.	04-05/02/2021	92.34	54.28	14.56	7.18	2.2
18.	05-06/02/2021	92.36	56.24	14.28	7.24	2.4
19.	11-12/02/2021	94.24	55.24	14.82	7.34	2.8
20.	12-13/02/2021	92.42	54.28	15.24	7.18	2.4
21.	18-19/02/2021	91.48	56.26	15.26	7.24	2.6
22.	19-20/02/2021	92.42	57.42	14.24	6.92	2.4
23.	26-27/02/2021	94.28	54.34	14.92	6.24	2.2
24.	27-28/02/2021	96.34	56.36	15.12	6.82	2.6

Ransugh



Analyst:

Authorized Signatory:

- NOTE :
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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana					
2.	Monitoring Period: DECEMBER 20 to FEBRUARY 21		3.	Sampling Location: Khedi Kankar Village near Sohna		
4.	Sample Drawn By: OTH&RC Team		5.	Reporting Date:- 10/03/2021		
6.	Test Requirement: PM₁₀, PM_{2.5}, SO₂, NO₂ & CO		7.	Season- Winter		

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	Co(mg/m ³)
1.	04-05/12/2020	80.34	27.68	14.26	7.56	1.8
2.	05-06/12/2020	80.72	26.52	13.28	7.24	2.0
3.	11-12/12/2020	81.26	26.88	12.34	7.22	1.6
4.	12-13/12/2020	80.52	27.36	14.14	7.42	1.4
5.	18-19/12/2020	83.08	27.88	13.82	8.26	1.8
6.	19-20/12/2020	80.62	26.98	12.98	7.46	2.2
7.	26-27/12/2020	82.90	26.82	13.88	7.16	1.6
8.	27-28/12/2020	84.04	26.24	14.78	8.18	2.0
9.	04-05/01/2021	84.24	25.34	15.24	8.24	2.2
10.	05-06/01/2021	82.34	24.56	16.34	8.16	1.8
11.	11-12/01/2021	86.24	25.42	17.42	7.24	1.6
12.	12-13/01/2021	84.26	25.64	16.92	7.62	1.2
13.	18-19/01/2021	84.24	25.42	16.34	7.42	1.4
14.	19-20/01/2021	86.54	24.58	17.24	8.12	1.6
15.	26-27/01/2021	82.34	22.34	18.62	8.62	1.8
16.	27-28/01/2021	84.26	24.26	17.24	8.40	1.6
17.	04-05/02/2021	80.26	24.58	17.28	7.54	1.2
18.	05-06/02/2021	81.24	24.62	18.24	7.84	1.4
19.	11-12/02/2021	88.34	25.34	16.96	7.88	1.6
20.	12-13/02/2021	86.56	25.32	17.24	7.42	1.2
21.	18-19/02/2021	86.54	26.42	17.22	7.62	1.6
22.	19-20/02/2021	88.36	26.48	18.32	7.44	1.8
23.	26-27/02/2021	86.24	26.52	18.20	7.16	1.8
24.	27-28/02/2021	84.42	24.62	16.32	7.42	1.6
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)

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Analyst:

Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : - HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Monitoring Period: DECEMBER20 to FEBRUARY21	3.	Sampling Location: - Farukh Nagar Town
4.	Sample Drawn By: OTH&RC Team	5.	Reporting Date:- 10/03/2021
6.	Test Requirement: PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ & CO	7.	Season- Winter

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				Co(mg/m3)
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	
1.	06-07/12/2020	193.92	88.26	44.24	28.54	2.8
2.	07-08/12/2020	199.84	98.26	44.26	26.52	3.0
3.	13-14/12/2020	190.26	92.54	43.66	27.92	2.8
4.	14-15/12/2020	191.42	96.94	44.56	26.88	2.6
5.	20-21/12/2020	192.44	87.42	44.24	26.98	2.8
6.	21-22/12/2020	192.56	88.94	44.96	27.82	3.2
7.	28-29/12/2020	196.08	82.12	44.54	27.94	2.8
8.	29-30/12/2020	192.24	86.04	44.88	27.96	2.6
9.	06-07/01/2021	192.32	84.56	46.34	28.42	2.2
10.	07-08/01/2021	198.34	84.24	42.32	26.54	2.4
11.	13-14/01/2021	188.42	86.32	40.28	24.56	2.6
12.	14-15/01/2021	190.32	84.22	43.24	24.56	2.4
13.	20-21/01/2021	191.28	86.36	43.26	25.34	2.6
14.	21-22/01/2021	192.42	84.24	44.62	25.62	2.4
15.	28-29/01/2021	194.24	94.24	44.28	26.42	2.8
16.	29-30/01/2021	194.22	92.34	44.26	26.58	3.0
17.	06-07/02/2021	184.24	90.42	45.62	27.46	3.2
18.	07-08/02/2021	182.34	91.24	43.24	28.45	3.4
19.	13-14/02/2021	196.24	92.34	42.34	26.58	3.2
20.	14-15/02/2021	192.42	96.34	40.26	24.34	3.0
21.	20-21/02/2021	194.28	94.54	41.24	25.42	3.2
22.	21-22/02/2021	192.42	92.34	42.32	25.82	3.6
23.	01-02/03/2021	192.42	94.28	42.38	24.56	3.4
24.	02-03/03/2021	192.40	96.34	41.34	25.42	3.2
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)

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Analyst:

Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : - HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Monitoring Period: DECEMBER 20 TO FEBRUARY 21	3.	Sampling Location ; - Kharkoda Town
4.	Sample Drawn By: OTH&RC Team	5.	Reporting Date:- 10/03/2021
6.	Test Requirement: PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ & CO	7.	Season- Winter

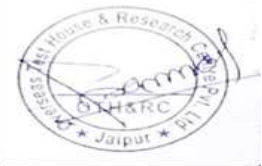
TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	PARAMETER				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	Co(mg/m ³)
1.	06-07/12/2020	77.08	59.82	10.32	7.52	1.8
2.	07-08/12/2020	76.98	50.18	11.58	7.50	2.0
3.	13-14/12/2020	78.54	59.54	10.72	7.48	1.6
4.	14-15/12/2020	77.26	58.52	11.08	7.92	2.0
5.	20-21/12/2020	78.12	59.82	10.88	7.26	1.6
6.	21-22/12/2020	82.94	58.42	9.52	7.24	2.2
7.	28-29/12/2020	76.36	58.56	10.16	7.36	1.8
8.	29-30/12/2020	81.24	59.64	11.52	7.54	2.0
9.	06-07/01/2021	74.56	52.34	12.34	7.62	2.4
10.	07-08/01/2021	76.84	60.24	11.24	6.92	2.2
11.	13-14/01/2021	75.64	61.24	11.96	8.12	2.8
12.	14-15/01/2021	74.56	58.42	11.24	7.88	2.6
13.	20-21/01/2021	74.24	56.32	10.82	7.56	1.8
14.	21-22/01/2021	75.62	54.24	10.26	7.42	1.6
15.	28-29/01/2021	76.24	56.28	11.24	7.66	2.0
16.	29-30/01/2021	74.56	58.42	11.62	7.62	2.4
17.	06-07/02/2021	74.26	60.24	10.24	7.82	2.0
18.	07-08/02/2021	74.62	61.28	11.42	7.88	1.4
19.	13-14/02/2021	74.58	62.34	11.44	8.24	1.6
20.	14-15/02/2021	74.26	60.24	11.34	8.12	1.8
21.	20-21/02/2021	74.52	54.28	11.26	8.66	1.6
22.	21-22/02/2021	75.62	56.34	12.34	8.28	1.8
23.	01-02/03/2021	74.58	54.28	11.26	8.26	1.6
24.	02-03/03/2021	72.56	56.28	11.46	8.16	1.8
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)

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Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : - HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Monitoring Period: DECEMBER20 to FERBRUARY21	3.	Sampling Location: Village :- Mandothi
4.	Sample Drawn By: OTH&RC Team	5.	Reporting Date:- 10/03/2021
6.	Test Requirement: PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ & CO	7.	Season- Winter

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	Co(mg/m ³)
1.	06-07/12/2020	73.92	47.26	12.24	6.54	1.6
2.	07-08/12/2020	73.84	46.96	13.26	6.52	1.4
3.	13-14/12/2020	70.26	47.54	12.66	7.12	1.8
4.	14-15/12/2020	71.42	46.94	13.56	7.18	2.0
5.	20-21/12/2020	72.44	47.42	14.24	6.98	2.2
6.	21-22/12/2020	68.56	47.94	13.24	7.42	1.8
7.	28-29/12/2020	69.08	48.12	14.28	7.44	1.6
8.	29-30/12/2020	72.24	48.04	13.28	7.46	1.4
9.	06-07/01/2021	71.26	46.28	13.24	6.54	1.8
10.	07-08/01/2021	72.34	46.22	14.26	6.24	1.6
11.	13-14/01/2021	73.26	45.28	14.58	6.84	1.8
12.	14-15/01/2021	74.56	46.26	13.24	6.28	1.4
13.	20-21/01/2021	72.34	47.28	13.32	6.54	2.2
14.	21-22/01/2021	71.26	47.26	14.52	6.26	2.0
15.	28-29/01/2021	70.26	46.34	14.56	6.28	1.6
16.	29-30/01/2021	72.34	46.32	14.52	7.12	1.4
17.	06-07/02/2021	71.26	46.34	13.24	7.14	1.8
18.	07-08/02/2021	70.26	47.32	14.28	7.24	1.6
19.	13-14/02/2021	70.24	42.34	13.24	7.22	1.2
20.	14-15/02/2021	71.26	43.62	13.28	7.42	1.4
21.	20-21/02/2021	71.28	42.38	13.24	7.26	1.2
22.	21-22/02/2021	70.34	44.22	13.26	7.12	1.6
23.	01-02/03/2021	71.26	43.28	13.28	7.26	1.8
24.	02-03/03/2021	72.38	42.82	13.26	7.46	1.6
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : -- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana	
2.	Monitoring Period: DECEMBER20 to FEBRUARY21	3. Sampling Location :-village- Asoda Town
4.	Sample Drawn By: OTH&RC Team	5. Reporting Date:- 10/03/2021
6.	Test Requirement:PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ & CO	7. Season- Winter

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	Co(mg/m ³)
1.	06-07/12/2020	86.14	50.64	15.82	6.90	1.6
2.	07-08/12/2020	85.76	51.74	14.24	6.98	2.2
3.	13-14/12/2020	86.82	52.46	13.08	7.08	1.8
4.	14-15/12/2020	85.48	52.84	14.92	7.24	2.0
5.	20-21/12/2020	84.04	52.92	13.08	7.22	2.4
6.	21-22/12/2020	85.14	51.86	12.24	7.24	2.2
7.	28-29/12/2020	86.28	52.56	14.48	7.26	2.8
8.	29-30/12/2020	88.48	51.66	13.58	7.24	2.6
9.	06-07/01/2021	87.24	52.34	13.32	6.54	1.8
10.	07-08/01/2021	86.28	54.26	14.52	6.24	1.6
11.	13-14/01/2021	85.34	52.42	14.56	6.84	2.0
12.	14-15/01/2021	86.32	51.24	14.52	6.28	2.4
13.	20-21/01/2021	87.56	52.36	13.24	6.54	1.6
14.	21-22/01/2021	88.24	54.28	14.28	6.26	2.0
15.	28-29/01/2021	84.62	56.34	13.24	6.28	1.4
16.	29-30/01/2021	85.64	56.42	13.28	7.12	1.6
17.	06-07/02/2021	86.58	56.82	13.24	7.14	1.8
18.	07-08/02/2021	84.56	54.28	13.26	7.24	1.6
19.	13-14/02/2021	85.64	54.68	13.28	7.22	1.8
20.	14-15/02/2021	85.42	55.64	13.26	7.24	1.6
21.	20-21/02/2021	86.26	54.26	13.32	7.12	1.4
22.	21-22/02/2021	82.34	52.34	13.24	7.18	2.0
23.	01-02/03/2021	86.36	52.42	14.26	7.20	1.4
24.	02-03/03/2021	84.56	54.24	12.96	7.26	1.8
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)

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Analyst:

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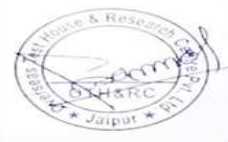
TEST REPORT

1.	Name & Address of Client : HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana	
2.	Monitoring Period: DECEMBER20 TO FEBRUARY21	3. Sampling Location :- village;- Harsana kala
4.	Sample Drawn By: OTH&RC Team	5. Reporting Date:- 10/03/2021
6.	Test Requirement: PM₁₀, PM_{2.5}, SO₂, NO₂ & CO	7. Season- Winter

TEST RESULTS

Ambient Air Quality Analysis

S.NO	Date	Parameters				
		PM ₁₀ (ug/m ³)	PM _{2.5} (ug/m ³)	NO ₂ (ug/m ³)	SO ₂ (ug/m ³)	Co(mg/m ³)
1.	06-07/12/2020	76.14	48.56	15.42	6.48	1.8
2.	07-08/12/2020	75.76	52.34	16.14	6.84	1.6
3.	13-14/12/2020	68.82	58.64	17.08	7.14	1.4
4.	14-15/12/2020	75.48	54.62	15.92	7.24	1.6
5.	20-21/12/2020	74.04	56.28	17.08	7.64	1.8
6.	21-22/12/2020	75.14	54.62	17.19	7.42	1.6
7.	28-29/12/2020	76.28	52.34	17.42	7.62	2.0
8.	29-30/12/2020	78.48	54.62	16.58	7.56	1.8
9.	06-07/01/2021	74.26	56.32	15.42	6.54	1.6
10.	07-08/01/2021	74.52	54.28	16.34	6.74	1.8
11.	13-14/01/2021	74.26	52.34	14.28	6.54	1.6
12.	14-15/01/2021	74.52	51.42	15.26	7.14	2.0
13.	20-21/01/2021	74.62	51.36	16.28	7.12	2.2
14.	21-22/01/2021	75.34	54.28	16.26	7.18	1.8
15.	28-29/01/2021	74.28	55.24	17.56	7.12	1.8
16.	29-30/01/2021	76.42	54.26	16.34	7.24	1.9
17.	06-07/02/2021	72.34	54.82	17.06	7.26	1.2
18.	07-08/02/2021	74.56	53.28	17.60	6.54	1.4
19.	13-14/02/2021	75.62	54.24	17.20	6.58	1.6
20.	14-15/02/2021	74.56	54.28	18.40	6.54	1.8
21.	20-21/02/2021	73.28	52.34	16.28	6.24	1.8
22.	21-22/02/2021	74.56	54.28	16.24	7.12	1.6
23.	01-02/03/2021	76.24	54.32	17.42	7.14	2.0
24.	02-03/03/2021	74.26	54.28	16.28	7.24	1.6
Prescribed NAAQ Standards		100	60	80	80	04(1.0 hourly)



Ransugh

Analyst:

Authorized Signatory:

- NOTE :
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 - 2) Re analysis of sample will be done, if requested within 15 days from the date of Reporting of sample if the samples are not consumed during analysis.
 - 3) All disputes subject to Jaipur Jurisdiction and our liability is limited to invoiced value only.



Address: 19A, Shivpuri Colony Extension, Jeen Mata Marg, Jhotwara, Jaipur – 3020:
Tel: +91-141-2466766, E-mail: overseastesthouse@gmail.com,



OVERSEAS TEST HOUSE & RESEARCH CENTRE PVT. LTD.



(An ISO 9001:2008, 14001:2004, OHSAS 18001:2007 Certified & NABL Accredited Laboratory)

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Tel: +91-141-2744509, Mobile: +91-9460221084, E-mail: arun.omtc@gmail.com



Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID:- 060JAN21NS01	3.	REPORTING DATE : 10/01/2021
4.	Location: - New prithla Rly station village-prithia Tehsil & District –palwal (Haryana)		
5.	Monitoring Date: 12-13/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Commercial Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	60.20	62.9
7.00	60.30	62.9
8.00	60.10	62.9
9.00	60.40	62.9
10.00	60.30	62.7
11.00	60.30	62.4
12.00	60.20	62.7
1.00	60.20	62.7
2.00	60.50	62.8
3.00	60.80	62.7
4.00	60.30	62.9
5.00	60.50	62.5
6.00	60.10	62.8
7.00	60.20	62.4
8.00	60.10	62.7
9.00	60.10	62.4
10.00	60.20	62.9
11.00	55.4	58.9
12.00	56.3	58.3
1.00	56.1	58.8
2.00	56.5	58.7
3.00	56.1	58.9
4.00	56.2	58.9
5.00	56.1	58.9
6.00	56.1	58.8

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Certificate No.: TC-5165

Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	62.90	55.40	58.30	72.30	72.50	72.57	58.24	65.41	65.40

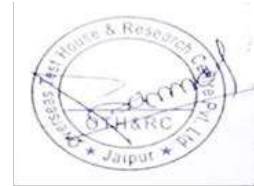
Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq

Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: :- 060JAN21NS02	3.	REPORTING DATE : 10/01/2021
4.	Location: Village- Near village- Sultanpur, Tehsil-Farukhnagar, District-Gurugram(Haryana)		
5.	Monitoring Date: 13-14/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	52.20	53.7
7.00	52.40	53.9
8.00	52.20	53.8
9.00	52.20	53.6
10.00	52.10	53.4
11.00	52.10	53.8
12.00	52.10	58.7
1.00	53.8	53.8
2.00	52.20	53.9
3.00	52.10	53.9
4.00	52.20	53.9
5.00	52.20	53.9
6.00	52.20	53.8
7.00	52.20	53.8
8.00	52.20	53.8
9.00	52.10	53.9
10.00	52.20	53.7
11.00	42.0	43.7
12.00	42.4	43.8
1.00	42.2	43.5
2.00	42.6	43.9
3.00	42.1	43.8
4.00	42.1	43.8
5.00	42.1	43.8
6.00	41.8	43.6



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Certificate No.: TC-5165

Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	58.70	41.80	43.74	63.71	63.85	63.72	43.80	53.76	54.18

Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq		
Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID:- 060JAN21NS03	3.	REPORTING DATE : 10/01/2021
4.	Location: Village –Fazalwas,Tehsil-Manesar, District-Gurugram(Haryana)		
5.	Monitoring Date: -14-15/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	53.60	54.6
7.00	53.30	54.7
8.00	53.30	54.8
9.00	53.30	54.6
10.00	53.20	54.6
11.00	53.30	54.6
12.00	53.20	54.6
1.00	53.8	54.7
2.00	53.20	54.9
3.00	53.30	54.9
4.00	53.10	54.6
5.00	53.20	54.6
6.00	53.20	54.7
7.00	53.30	54.6
8.00	53.20	54.8
9.00	53.20	54.9
10.00	53.60	54.6
11.00	42.0	43.6
12.00	42.2	43.7
1.00	42.2	43.7
2.00	42.2	43.9
3.00	42.2	43.4
4.00	42.0	43.7
5.00	42.0	43.6
6.00	42.3	43.7

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Certificate No.: TC-5165

Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	54.90	42.00	43.82	67.47	67.73	64.74	43.83	55.78	55.8

Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq		
Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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TEST REPORT

1.	Name & Address of Client - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060JAN21NS04	3.	REPORTING DATE : 10/01/2021
4.	Location: - Manesar Town, District- Gurugram(haryana)		
5.	Monitoring Date: 15-16/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	52.20	54.8
7.00	52.30	54.8
8.00	52.40	54.8
9.00	52.20	54.9
10.00	52.90	54.7
11.00	52.10	53.5
12.00	52.40	54.7
1.00	53.8	54.8
2.00	52.20	54.7
3.00	52.50	54.8
4.00	52.20	54.7
5.00	52.40	54.6
6.00	52.30	54.7
7.00	52.40	54.9
8.00	52.20	54.7
9.00	52.40	54.8
10.00	52.20	54.8
11.00	43.2	44.3
12.00	43.3	44.2
1.00	43.2	44.7
2.00	43.1	44.2
3.00	43.1	44.7
4.00	43.5	44.7
5.00	43.2	44.8
6.00	43.2	44.9

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Certificate No.: TC-5165

Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	54.90	43.10	44.65	66.90	67.46	67	45	56	56.1

Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq		
Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client;- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060JAN21NS05	3.	REPORTING DATE : 10/01/2021
4.	Location: - Village :- Khedi Kankar near Tehsil & District Nuh(Haryana)		
5.	Monitoring Date: 16-17/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	52.10	53.8
7.00	52.30	53.7
8.00	52.20	53.7
9.00	52.40	53.7
10.00	52.50	53.6
11.00	52.10	53.5
12.00	52.10	53.7
1.00	53.8	53.7
2.00	52.10	53.8
3.00	52.50	53.5
4.00	52.10	53.9
5.00	52.20	53.9
6.00	52.10	53.6
7.00	52.10	53.9
8.00	52.10	53.5
9.00	52.10	53.6
10.00	52.10	53.8
11.00	41.1	42.7
12.00	41.4	42.7
1.00	41.1	42.9
2.00	41.4	42.8
3.00	41.5	42.6
4.00	41.4	42.8
5.00	41.3	42.6
6.00	41.1	42.1

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Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	53.90	41.10	42.73	66.50	66.76	66.50	42.67	54.59	54.60

Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq		
Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060JAN21NS06	3.	REPORTING DATE : 10/01/2021
4.	Location - Farukh Nagar Town, District-Gurugram(haryana)		
5.	Monitoring Date: 17-18/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	51.20	52.7
7.00	51.50	52.7
8.00	51.30	52.7
9.00	51.20	52.8
10.00	51.30	52.9
11.00	51.20	52.7
12.00	51.20	52.8
1.00	53.8	52.8
2.00	51.10	52.8
3.00	51.10	52.8
4.00	51.20	52.9
5.00	51.20	52.8
6.00	51.20	52.8
7.00	51.30	52.8
8.00	51.20	52.8
9.00	51.10	52.8
10.00	51.20	52.7
11.00	42.1	42.8
12.00	42.1	42.8
1.00	42.1	42.8
2.00	42.1	42.8
3.00	42.3	42.8
4.00	42.1	42.9
5.00	42.1	42.9
6.00	42.2	42.8

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Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	52.90	42.10	43.20	65.58	65.73	65.60	43.22	54.41	54.50

Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq

Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060JAN21NS07	3.	REPORTING DATE : 10/01/2021
4.	Location:- Kharkoda Town,District-sonipt (Haryana)		
5.	Monitoring Date: 19-20/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	53.20	54.8
7.00	52.70	54.8
8.00	52.40	54.7
9.00	53.40	55.2
10.00	52.60	54.7
11.00	53.20	54.9
12.00	52.70	54.8
1.00	53.8	57.0
2.00	52.70	54.9
3.00	52.60	54.8
4.00	53.60	54.8
5.00	52.30	54.7
6.00	52.90	54.6
7.00	53.30	55.0
8.00	52.70	57.2
9.00	53.60	54.9
10.00	53.20	54.8
11.00	42.2	44.3
12.00	41.4	43.9
1.00	41.9	43.9
2.00	42.2	43.6
3.00	42.7	43.9
4.00	41.9	43.9
5.00	41.3	43.8
6.00	41.7	43.9

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Tel: +91-141-2744509, Mobile: +91-9460221084, E-mail: arun.omtc@gmail.com



Certificate No.: TC-5165

Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	57.20	41.30	43.81	67.51	67.87	64.87	43.84	55.82	55.90

Method Used 9899:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq

Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

NOTE :

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060JAN21NS08	3.	REPORTING DATE : 10/01/2021
4.	Location: Village- Mandothi ,Tehsil-Bahaduragarh District-jhajjar(Haryana)		
5.	Monitoring Date: 21-22/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	52.60	54.7
7.00	52.70	54.8
8.00	52.80	55.2
9.00	52.60	55.0
10.00	52.40	55.2
11.00	52.90	54.8
12.00	52.60	54.8
1.00	53.8	55.0
2.00	52.60	54.8
3.00	52.90	54.8
4.00	52.50	55.0
5.00	52.00	55.3
6.00	52.60	54.8
7.00	52.70	55.3
8.00	52.20	54.4
9.00	52.70	55.7
10.00	52.60	54.7
11.00	34.3	42.5
12.00	39.8	44.6
1.00	40.3	43.6
2.00	40.3	43.7
3.00	41.2	43.0
4.00	40.0	42.8
5.00	39.0	42.5
6.00	40.2	43.7



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Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	55.70	34.30	42.26	67.35	67.70	67.13	41.88	54.50	54.85

Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq

Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060JAN21NS09	3.	REPORTING DATE : 10/01/2021
4.	Location: Asoda Town, Tehsil-Bahaduragarh District-jhajjar(Haryana)		
5.	Monitoring Date: 23-24/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	53.70	54.5
7.00	53.50	54.8
8.00	53.60	54.9
9.00	53.50	54.8
10.00	53.10	54.9
11.00	53.00	54.9
12.00	53.8	54.9
1.00	53.10	54.7
2.00	53.50	54.9
3.00	53.30	54.8
4.00	53.00	54.7
5.00	53.10	54.9
6.00	53.10	54.9
7.00	53.00	54.8
8.00	53.00	54.6
9.00	53.70	54.9
10.00	53.50	54.5
11.00	43.1	44.7
12.00	43.2	44.8
1.00	43.2	44.9
2.00	43.1	44.9
3.00	43.1	44.8
4.00	43.1	44.8
5.00	43.1	44.9
6.00	43.0	44.9

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Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	54.90	43.00	44.81	67.63	67.73	67.44	44.80	56.12	56.40

Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq

Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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TEST REPORT

1.	Name & Address of Client :- M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060JAN21NS010	3.	REPORTING DATE : 10/01/2021
4.	Location: Village-Harsana kala Tehsil & District-sonipt (haryana)		
5.	Monitoring Date: 24-25/12/2020	6.	Season: Winter
7.	Instrument Used: Sound Level Meter	8.	Instrument Calibration Status: -Calibrated
9.	Meteorological condition during monitoring: Clear Sky	10.	Sample Collected By: OTHRC Team
11.	Category of Area: Residential Area	12.	Sampling Duration: 24 Hours
13.	Surrounding Activity: Human & Vehicular Activites	14.	Sampling & Analysis Protocol: CPCB Guidelines/IS 9989

Time (Hrs.)	Noise Level dB(A)	
	Min.	Max
6.00	51.20	52.9
7.00	51.10	52.9
8.00	51.30	52.9
9.00	51.10	52.8
10.00	51.20	52.4
11.00	51.40	52.9
12.00	51.20	52.9
1.00	51.10	52.9
2.00	51.20	52.4
3.00	51.10	52.8
4.00	51.40	52.7
5.00	51.00	52.9
6.00	51.60	52.9
7.00	51.30	52.8
8.00	51.50	52.9
9.00	51.10	52.7
10.00	51.20	52.9
11.00	42.1	43.7
12.00	42.1	43.7
1.00	42.0	43.7
2.00	42.0	43.9
3.00	42.0	43.9
4.00	42.1	43.9
5.00	42.1	43.8
6.00	42.0	43.7

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Noise Level Monitoring Report Summary

Time	Mix. dB (A)	Min. dB (A)	L10	L50	L90	L _{day}	L _{night}	L _{DN}	LEQ dB (A)
6.00AM to 6.00 AM	57.90	42.00	43.64	65.58	65.74	65.62	43.50	54.56	54.56

Method Used 9989:1981

Requirement (as CPCB Guidelines Limit in dB(A) Leq

Category of Area/Zone	Day Time	Night Time
A. Industrial Area	75	70
B. Commercial Area	65	55
C. Residential Area	55	45
D. Silence Zone	50	40

Remarks:

Analyst:



Authorized Signatory:

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TEST REPORT

1.	Name & Address of Client: M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID; 060DEC20WA01	3.	Reporting Date : 25/12/2020
4.	LOCATION: Village :- Khedi Kankar		
5.	Sampling Date : 19/12/2020	6.	SAMPLE DRAWN BY: OTH&RC TEAM
7.	Analysis Commenced Date: 20/12/2025	8.	Analysis completed on: 25/12/2025
9.	Sample Category: Ground Water	10.	Packing Condition & Quantity: Packed bottle & 3 Ltr.

TEST RESULTS

WATER REPORT

S. No.	Parameters	Unit (SI)	Results	Specification / SPCB Norms/BIS Standards	Method Used
1.	pH		7.78	6.5-8.5	APHA: 4500-H+ B 23 rd Edition
2.	Conductivity	mS/m	220.0	--	APHA: 2510 B. 23 rd Edition
3.	Turbidity	NTU	<1.0		APHA: 2130-B Nephelometric Method 23 rd Edition
4.	Colour	Pt-Co	<5.0	5	APHA: 2120-b Visual Comparison Method 23 rd Edition
5.	COD	mg/l	-	--	APHA: 5220 B 23 rd Edition
6.	Total Dissolved Solids	mg/l	1350.0	500	APHA: 2540 C 23 rd Edition
7.	Dissolved Oxygen (D.O)	mg/l	-	--	APHA: 4500 O-C 23 rd Edition
8.	Alkalinity	mg/l	168.0	200	APHA: 2320 B Alkalinity 23 rd Edition
9.	Chloride	mg/l	342.0	250	APHA: 4500-Cl-B 23 rd Edition
10.	Sulphate	mg/l	148.0	200	APHA: 4500-SO ⁴ E 23 rd Edition
11.	Fluoride	mg/l	0.98	1.0	APHA: 4500-F-D 23 rd Edition
12.	Sodium	mg/l	221.8	--	APHA: 3500-Na B 23 rd Edition

Remarks:

Jaya

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

<u>S.No.</u>	<u>Parameters</u>	<u>Unit (SI)</u>	<u>Results</u>	<u>Specification / SPCB Norms/BIS Standards</u>	<u>Method Used</u>
13.	Potassium	mg/l	112.6	--	APHA: 3500-K B 23 rd Edition
14.	Total Hardness	mg/l	416.0	200	APHA: 2340 C 23 rd Edition
15.	Ca. Hardness	mg/l	272.0	--	APHA: 3500-Ca B 23 rd Edition
16.	Calcium as Ca	mg/l	109.01	75	APHA: 3500-Ca B 23 rd Edition
17.	Mg. Hardness	mg/l	144.0	--	APHA: 3500-Mg B 23 rd Edition
18.	Magnesium as Mg	mg/l	35.07	30	APHA: 3500 - Mg B 23 rd Edition
19.	Amm. Nitrogen	mg/l	1.24	--	IS 3025 (PP 34) 1988 (RA 2014)
20.	Nitrate	mg/l	11.32	45	IS 3025 (Part 34) (3) 1988 (RA 2014)
21.	Phosphate	mg/l	0.96	--	APHA: 4500-PC 23 rd Edition
22.	Cadmium	mg/l	<0.1	0.003	APHA: 3111 B 23 rd Edition
23.	Copper	mg/l	<0.03	0.05	APHA: 3111 B 23 rd Edition
24.	Iron	mg/l	0.88	0.3	APHA: 3500 Fe-B 23 rd Edition
25.	Lead	mg/l	<0.15	0.01	APHA: 3111 B 23 rd Edition
26.	Manganese	mg/l	<0.03	0.1	APHA: 3111 B 23 rd Edition
27.	Zinc	mg/l	<0.06	5	APHA: 3111 B 23 rd Edition
28.	*Total coliform	MPN/100 ml	Absent	-	IS 1622

Remarks:

Jaya

Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID :- 060DEC20WA02	3.	Reporting Date : 25/12/2020
4.	LOCATION: - village :- ASODA TOWN		
5.	Sampling Date : 19/12/2020	6.	SAMPLE DRAWN BY: OTH&RC TEAM
7.	Analysis Commenced Date: 20/12/2020	8.	Analysis completed on: 25/12/2020
9.	Sample Category: Ground Water	10.	Packing Condition & Quantity: Packed bottle & 3 Ltr.

TEST RESULTS

WATER REPORT

S. No.	Parameters	Unit (SI)	Results	Specification/ SPCB Norms/BIS Standards	Method Used
1.	pH		7.82	6.5-8.5	APHA: 4500-H+ B 23 rd Edition
2.	Conductivity	mS/m	280.0	--	APHA: 2510 B. 23 rd Edition
3.	Turbidity	NTU	<1.0		APHA: 2130-B Nephelometric Method 23 rd Edition
4.	Colour	Pt-Co	<5.0	5	APHA: 2120-b Visual Comparison Method 23 rd Edition
5.	COD	mg/l	-	--	APHA: 5220 B 23 rd Edition
6.	Total Dissolved Solids	mg/l	1582.0	500	APHA: 2540 C 23 rd Edition
7.	Dissolved Oxygen (D.O)	mg/l	-	--	APHA: 4500 O-C 23 rd Edition
8.	Alkalinity	mg/l	388.0	200	APHA: 2320 B Alkalinity 23 rd Edition
9.	Chloride	mg/l	242.8	250	APHA: 4500-Cl-B 23 rd Edition
10.	Sulphate	mg/l	192.4	200	APHA: 4500-SO ⁴ E 23 rd Edition
11.	Fluoride	mg/l	0.96	1.0	APHA: 4500-F-D 23 rd Edition
12.	Sodium	mg/l	218.0	--	APHA: 3500-Na B 23 rd Edition
13.	Potassium	mg/l	98.42	--	APHA: 3500-K B 23 rd Edition

Remarks:

Jaya

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

S. No.	Parameters	Unit (SI)	Results	Specification/ SPCB Norms/BIS Standards	Method Used
14.	Total Hardness	mg/l	498.0	200	APHA: 2340 C 23 rd Edition
15.	Ca. Hardness	mg/l	296.0	--	APHA: 3500-Ca B 23 rd Edition
16.	Calcium as Ca	mg/l	118.63	75	APHA: 3500-Ca B 23 rd Edition
17.	Mg. Hardness	mg/l	202.0	--	APHA: 3500-Mg B 23 rd Edition
18.	Magnesium as Mg	mg/l	49.02	30	APHA: 3500 - Mg B 23 ^d Edition
19.	Amm. Nitrogen	mg/l	1.66	--	IS 3025 (PP 34) 1988 (RA 2014)
20.	Nitrate	mg/l	11.26	45	IS 3025 (Part 34) (3) 1988 (RA 2014)
21.	Phosphate	mg/l	1.82	--	APHA: 4500-PC 23 rd Edition
22.	Cadmium	mg/l	<0.1	0.003	APHA: 3111 B 23 rd Edition
23.	Copper	mg/l	<0.03	0.05	APHA: 3111 B 23 rd Edition
24.	Iron	mg/l	0.66	0.3	APHA: 3500 Fe-B 23 rd Edition
25.	Lead	mg/l	<0.15	0.01	APHA: 3111 B 23 rd Edition
26.	Manganese	mg/l	<0.03	0.1	APHA: 3111 B 23 rd Edition
27.	Zinc	mg/l	<0.06	5	APHA: 3111 B 23 rd Edition
28.	*Total coliform	MPN/100 ml	Absent	-	IS 1622

Remarks:

Jaya

Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID; 060DEC20WA03	3.	Reporting Date : 25/12/2020
4.	LOCATION: - Kharkoda TOWN		
5.	Sampling Date : 20/12/2020	6.	SAMPLE DRAWN BY: OTH&RC TEAM
7.	Analysis Commenced Date: 20/12/2020	8.	Analysis completed on 25/12/2020
9.	Sample Category: Ground Water	10.	Packing Condition & Quantity: Packed bottle & 3 Ltr.

TEST RESULTS

WATER REPORT

<u>S. No.</u>	<u>Parameters</u>	<u>Unit (SI)</u>	<u>Results</u>	<u>Specificatio n/ SPCB Norms/BIS Standards</u>	<u>Method Used</u>
1.	pH		7.88	6.5-8.5	APHA: 4500-H+ B 23 nd Edition
2.	Conductivity	mS/m	262.0	--	APHA: 2510 B. 23 nd Edition
3.	Turbidity	NTU	<1.0		APHA: 2130-B Nephelometric Method 23 nd Edition
4.	Colour	Pt-Co	<5.0	5	APHA: 2120-b Visual Comparison Method 23 nd Edition
5.	COD	mg/l	-	--	APHA: 5220 B 23 nd Edition
6.	Total Dissolved Solids	mg/l	1560.0	500	APHA: 2540 C 23 nd Edition
7.	Dissolved Oxygen (D.O)	mg/l	-	--	APHA: 4500 O-C 23 nd Edition
8.	Alkalinity	mg/l	312.0	200	APHA: 2320 B Alkalinity 23 nd Edition
9.	Chloride	mg/l	348.0	250	APHA: 4500-Cl-B 23 nd Edition
10.	Sulphate	mg/l	142.0	200	APHA: 4500-SO ⁴ E 23 nd Edition
11.	Fluoride	mg/l	0.88	1.0	APHA: 4500-F-D 23 nd Edition
12.	Sodium	mg/l	256.0	--	APHA: 3500-Na B 23 nd Edition

Remarks:

Jaya

Analyst:



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Certificate No.: TC-5165

<u>S. No.</u>	<u>Parameters</u>	<u>Unit (SI)</u>	<u>Results</u>	<u>Specificatio n/ SPCB Norms/BIS Standards</u>	<u>Method Used</u>
13.	Potassium	mg/l	112.9	--	APHA: 3500-K B 23 rd Edition
14.	Total Hardness	mg/l	556.0	200	APHA: 2340 C 23 rd Edition
15.	Ca. Hardness	mg/l	366.0	--	APHA: 3500-Ca B 23 rd Edition
16.	Calcium as Ca	mg/l	146.69	75	APHA: 3500-Ca B 23 rd Edition
17.	Mg. Hardness	mg/l	190.0	--	APHA: 3500-Mg B 23 rd Edition
18.	Magnesium as Mg	mg/l	46.28	30	APHA: 3500 - Mg B 23 ^d Edition
19.	Amm. Nitrogen	mg/l	0.88	--	IS 3025 (PP 34) 1988 (RA 2014)
20.	Nitrate	mg/l	12.66	45	IS 3025 (Part 34) (3) 1988 (RA 2014)
21.	Phosphate	mg/l	1.18	--	APHA: 4500-PC 23 rd Edition
22.	Cadmium	mg/l	<0.1	0.003	APHA: 3111 B 23 rd Edition
23.	Copper	mg/l	<0.03	0.05	APHA: 3111 B 23 rd Edition
24.	Iron	mg/l	0.82	0.3	APHA: 3500 Fe-B 23 rd Edition
25.	Lead	mg/l	<0.15	0.01	APHA: 3111 B 23 rd Edition
26.	Manganease	mg/l	<0.03	0.1	APHA: 3111 B 23 rd Edition
27.	Zinc	mg/l	<0.06	5	APHA: 3111 B 23 rd Edition
28.	*Total coliform	MPN/100 ml	Absent	-	IS 1622

Remarks:

Jaya

Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID; 060DEC20SW01	3.	Reporting Date : 25/12/2020
4.	LOCATION: - Near village Chapraula Tehsil & District –palwal (haryana) (CANAL)		
5.	Sampling Date : 16/12/2020	6.	SAMPLE DRAWN BY: OTH&RC TEAM
7.	Analysis Commenced Date: 20/12/2020	8.	Analysis completed on: 25/12/2020
9.	Sample Category: Surface Water	10.	Packing Condition & Quantity: Packed bottle & 3 Ltr.

TEST RESULTS

WATER REPORT

S. No.	Parameters	Unit (SI)	Results	Specification/ SPCB Norms/BIS Standards	Method Used
1.	pH		7.68	6.5-8.5	APHA: 4500-H+ B 23 rd Edition
2.	Conductivity	mS/m	420.0	--	APHA: 2510 B. 23 rd Edition
3.	Turbidity	NTU	<1.0		APHA: 2130-B Nephelometric Method 23 rd Edition
4.	Colour	Pt-Co	<5.0	5	APHA: 2120-b Visual Comparison Method 23 rd Edition
5.	COD	mg/l	70.24	--	APHA: 5220 B 23 rd Edition
6.	Total Dissolved Solids	mg/l	1390.0	500	APHA: 2540 C 23 rd Edition
7.	BOD	mg/l	18.24	--	APHA: 4500 O-C 23 rd Edition
8.	Alkalinity	mg/l	194.0	200	APHA: 2320 B Alkalinity 23 rd Edition
9.	Chloride	mg/l	342.0	250	APHA: 4500-Cl-B 23 rd Edition
10.	Sulphate	mg/l	232.0	200	APHA: 4500-SO ⁴ E 23 rd Edition
11.	Fluoride	mg/l	1.24	1.0	APHA: 4500-F-D 23 rd Edition
12.	Sodium	mg/l	346.0	--	APHA: 3500-Na B 23 rd Edition
13.	Potassium	mg/l	102.0	--	APHA: 3500-K B 23 rd Edition
14.	Total Hardness	mg/l	662.0	200	APHA: 2340 C 23 rd Edition

Remarks:

Sayg

Analyst:



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Certificate No.: TC-5165

S. No.	Parameters	Unit (SI)	Results	Specification/ SPCB Norms/BIS Standards	Method Used
15.	Ca. Hardness	mg/l	488.0	--	APHA: 3500-Ca B 23 rd Edition
16.	Calcium as Ca	mg/l	195.59	75	APHA: 3500-Ca B 23 rd Edition
17.	Mg. Hardness	mg/l	174.0	--	APHA: 3500-Mg B 23 rd Edition
18.	Magnesium as Mg	mg/l	42.38	30	APHA: 3500 - Mg B 23 ^d Edition
19.	Amm. Nitrogen	mg/l	1.78	--	IS 3025 (PP 34) 1988 (RA 2014)
20.	Nitrate	mg/l	10.34	45	IS 3025 (Part 34) (3) 1988 (RA 2014)
21.	Phosphate	mg/l	1.42	--	APHA: 4500-PC 23 rd Edition
22.	Cadmium	mg/l	<0.1	0.003	APHA: 3111 B 23 rd Edition
23.	Copper	mg/l	<0.03	0.05	APHA: 3111 B 23 rd Edition
24.	Iron	mg/l	0.56	0.3	APHA: 3500 Fe-B 23 rd Edition
25.	Lead	mg/l	<0.15	0.01	APHA: 3111 B 23 rd Edition
26.	Manganese	mg/l	<0.03	0.1	APHA: 3111 B 23 rd Edition
27.	Zinc	mg/l	<0.06	5	APHA: 3111 B 23 rd Edition
28.	*Total coliform	MPN/100 ml	Absent	---	IS 1622

Remarks:

Sayg

Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID; 060DEC20SW02	3.	Reporting Date : 25/12/2020
4.	LOCATION:- Near village Mandothi Tehsil-kharkhoda ,District –sonipat(haryana)		
5.	Sampling Date : 17/12/2020	6.	SAMPLE DRAWN BY: OTH&RC TEAM
7.	Analysis Commenced Date: 20/12/2020	8.	Analysis completed on: 25/12/2020
9.	Sample Category: Surface Water	10.	Packing Condition & Quantity: Packed bottle & 3 Ltr.

TEST RESULTS

WATER REPORT

S. No.	Parameters	Unit (SI)	Results	Specification/ SPCB Norms/BIS Standards	Method Used
1.	pH		7.72	6.5-8.5	APHA: 4500-H+ B 23 rd Edition
2.	Conductivity	mS/m	290.0	--	APHA: 2510 B. 23 rd Edition
3.	Turbidity	NTU	<1.0		APHA: 2130-B Nephelometric Method 23 rd Edition
4.	Colour	Pt-Co	<5.0	5	APHA: 2120-b Visual Comparison Method 23 rd Edition
5.	COD	mg/l	76.54	--	APHA: 5220 B 23 rd Edition
6.	Total Dissolved Solids	mg/l	1620.0	500	APHA: 2540 C 23 rd Edition
7.	BOD	mg/l	20.34	--	APHA: 4500 O-C 23 rd Edition
8.	Alkalinity	mg/l	198.0	200	APHA: 2320 B Alkalinity 23 rd Edition
9.	Chloride	mg/l	456.0	250	APHA: 4500-Cl-B 23 rd Edition
10.	Sulphate	mg/l	384.0	200	APHA: 4500-SO ⁴ E 23 rd Edition
11.	Fluoride	mg/l	0.98	1.0	APHA: 4500-F-D 23 rd Edition
12.	Sodium	mg/l	322.6	--	APHA: 3500-Na B 23 rd Edition
13.	Potassium	mg/l	156.0	--	APHA: 3500-K B 23 rd Edition
14.	Total Hardness	mg/l	710.0	200	APHA: 2340 C 23 rd Edition

Remarks:

Jayg

Analyst:



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Certificate No.: TC-5165

S. No.	Parameters	Unit (SI)	Results	Specification/ SPCB Norms/BIS Standards	Method Used
15.	Ca. Hardness	mg/l	476.0	--	APHA: 3500-Ca B 23 rd Edition
16.	Calcium as Ca	mg/l	190.78	75	APHA: 3500-Ca B 23 rd Edition
17.	Mg. Hardness	mg/l	234.0	--	APHA: 3500-Mg B 23 rd Edition
18.	Magnesium as Mg	mg/l	57.00	30	APHA: 3500 - Mg B 23 ^d Edition
19.	Amm. Nitrogen	mg/l	1.68	--	IS 3025 (PP 34) 1988 (RA 2014)
20.	Nitrate	mg/l	9.82	45	IS 3025 (Part 34) (3) 1988 (RA 2014)
21.	Phosphate	mg/l	1.16	--	APHA: 4500-PC 23 rd Edition
22.	Cadmium	mg/l	<0.1	0.003	APHA: 3111 B 23 rd Edition
23.	Copper	mg/l	<0.03	0.05	APHA: 3111 B 23 rd Edition
24.	Iron	mg/l	0.86	0.3	APHA: 3500 Fe-B 23 rd Edition
25.	Lead	mg/l	<0.15	0.01	APHA: 3111 B 23 rd Edition
26.	Manganease	mg/l	<0.03	0.1	APHA: 3111 B 23 rd Edition
27.	Zinc	mg/l	<0.06	5	APHA: 3111 B 23 rd Edition
28.	*Total coliform	MPN/100 ml	Absent	-	IS 1622

Remarks:

Sayg

Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID; 058JAN21SW03	3.	Reporting Date : 25/12/2020
4.	LOCATION:- Near village- Rohat Tehsil-kharkhoda ,District –sonipat(hariyana)		
5.	Sampling Date : 16/12/2020	6.	SAMPLE DRAWN BY: OTH&RC TEAM
7.	Analysis Commenced Date: 20/12/2020	8.	Analysis completed on: 25/12/2020
9.	Sample Category: Surface Water	10.	Packing Condition & Quantity: Packed bottle & 3 Ltr.

TEST RESULTS

WATER REPORT

S. No.	Parameters	Unit (SI)	Results	Specification/ SPCB Norms/BIS Standards	Method Used
1.	pH		7.62	6.5-8.5	APHA: 4500-H+ B 23 rd Edition
2.	Conductivity	mS/m	240.0	--	APHA: 2510 B. 23 rd Edition
3.	Turbidity	NTU	<1.0		APHA: 2130-B Nephelometric Method 23 rd Edition
4.	Colour	Pt-Co	<5.0	5	APHA: 2120-b Visual Comparison Method 23 rd Edition
5.	COD	mg/l	82.34	--	APHA: 5220 B 23 rd Edition
6.	Total Dissolved Solids	mg/l	1420.0	500	APHA: 2540 C 23 rd Edition
7.	Dissolved Oxygen (D.O)	mg/l	21.36	--	APHA: 4500 O-C 23 rd Edition
8.	Alkalinity	mg/l	198.0	200	APHA: 2320 B Alkalinity 23 rd Edition
9.	Chloride	mg/l	356.0	250	APHA: 4500-Cl-B 23 rd Edition
10.	Sulphate	mg/l	228.4	200	APHA: 4500-SO ⁴ E 23 rd Edition
11.	Fluoride	mg/l	1.26	1.0	APHA: 4500-F-D 23 rd Edition
12.	Sodium	mg/l	322.6	--	APHA: 3500-Na B 23 rd Edition
13.	Potassium	mg/l	119.66	--	APHA: 3500-K B 23 rd Edition
14.	Total Hardness	mg/l	510.0	200	APHA: 2340 C 23 rd Edition

Remarks:

Jayg

Analyst:



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Certificate No.: TC-5165

S. No.	Parameters	Unit (SI)	Results	Specification/ SPCB Norms/BIS Standards	Method Used
15.	Ca. Hardness	mg/l	376.0	--	APHA: 3500-Ca B 23 rd Edition
16.	Calcium as Ca	mg/l	150.0	75	APHA: 3500-Ca B 23 rd Edition
17.	Mg. Hardness	mg/l	134.0	--	APHA: 3500-Mg B 23 rd Edition
18.	Magnesium as Mg	mg/l	32.64	30	APHA: 3500 - Mg B 23 ^d Edition
19.	Amm. Nitrogen	mg/l	126	--	IS 3025 (PP 34) 1988 (RA 2014)
20.	Nitrate	mg/l	0.94	45	IS 3025 (Part 34) (3) 1988 (RA 2014)
21.	Phosphate	mg/l	1.12	--	APHA: 4500-PC 23 rd Edition
22.	Cadmium	mg/l	<0.1	0.003	APHA: 3111 B 23 rd Edition
23.	Copper	mg/l	<0.03	0.05	APHA: 3111 B 23 rd Edition
24.	Iron	mg/l	0.66	0.3	APHA: 3500 Fe-B 23 rd Edition
25.	Lead	mg/l	<0.15	0.01	APHA: 3111 B 23 rd Edition
26.	Manganease	mg/l	<0.03	0.1	APHA: 3111 B 23 rd Edition
27.	Zinc	mg/l	<0.06	5	APHA: 3111 B 23 rd Edition
28.	*Total coliform	MPN/100 ml	Absent	-	IS 1622

Remarks:

Sayg

Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060DEC20SS01	3	Reporting Date: 25/12/2020
4.	Location:- Near village- Ghuspethi ,Tehsil -sohna District-Gurugram (Haryana)		
5.	Sampling Date: -15/12/2020	6.	Sample Drawn By: OTH&RC Team
7.	Analysis Commenced Date 20/12/2020	8.	Analysis completed on: 25/12/2020
9.	Season: WINTER	10.	Packing Condition & Quantity: 2.0 kg

TEST RESULTS

SOIL REPORT

S.No	Parameters	Unit (SI)	Results	Method Used
1.	PH		7.67	Is 2720 (part-26)1987(RA-2011)
2.	Conductivity	mS/m	46.0	Is :14767-2000 (RA-2010)
3.	Moisture content	%	4.26	Is:2720 (part-2)1973 (RA-2010)
4.	WHC	%	29.82	LAB-SOP-049
5.	Specific Gravity	-	2.62	Is:2720 (part-3)
6.	Porosity	%	37.40	IS 2720 (part-7)1980(RA-2010)
7.	Bulk density	gm/ml	1.64	Is:1462 1985(RA-2006)
8.	Available sodium	kg/ha	114.0	LAB-SOP-059
9.	Availablepotassium	kg/ha	396.0	LAB-SOP-060
10.	Available calcium	mg/100g	18.20	LAB-SOP-061
11.	AvailableMagnsium	mg/100g	20.34	LAB-SOP-062
12.	Nitrate Nitrogen	%	0.036	14684:1999(RA-2014)
13.	Total Phosphate	kg/ha	36.52	LAB-SOP-063
14.	Cadmium	Mg/kg	2.16	USEPA3050B
15.	Copper	Mg/kg	172.0	USEPA3050B
16.	Lead	Mg/kg	0.96	USEPA3050B

Jaya

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

17	Manganese	Mg/kg	2.14	USEPA3050B
18	Zinc	Mg/kg	82.6.	USEPA3050B
19	Iron	Mg/kg	1896	USEPA3050B
20	Boron	Mg/kg	<0.5	LAB SOP-96
21	CEC(Cationexchange Capacity)	Meq/100gm	24.62	LAB SOP-085
22	Organic Carbone	%	0.76	Is :2720 (part-22)
23	Available Nitrogen	%	0.072	LAB SOP-95
24	Available phosphorus	Kg/ha	34.26	LAB SOP-94
25	ESP(Exchangeable Sodium Percentage)	%	6.24	LAB SOP-085
26	Texture:	Sandy Clay loam		Is :-2720(part-4)
27	SAND	%	62.34	Is :-2720(part-4)
28	silt	%	14.26	Is :-2720(part-4)
29	clay	%	23.40	Is :-2720(part-4)

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Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060DEC20SS02	3	Reporting Date: 25/12/2020
4.	Location:- Near KMP Manesar, District-Gurugram(haryana)		
5.	Sampling Date: -15/12/2020	6.	Sample Drawn By: OTH&RC Team
7.	Analysis Commenced Date :- 20/12/2020	8.	Analysis completed on: 25/12/2020
9.	Season: WINTER	10.	Packing Condition & Quantity: 2.0 kg

TEST RESULTS(SOIL TEST)

S.No	Parameters	Unit (SI)	Results	Method Used
1.	pH		7.74	Is 2720 (part-26)1987(RA-2011)
2.	Conductivity	mS/m	42.0	Is :14767 (RA-2010)
3.	Moisture content	%	3.92	Is:2720 (part-2)1973 (RA-2010)
4.	WHC	%	32.16	LAB-SOP-049
5.	Specific Gravity	-	2.60	Is:2720 (part-3)
6.	Porosity	%	33.85	IS 2720 (part-7)1980(RA-2010)
7.	Bulk density	gm/ml	1.72	Is:1462 1985(RA-2006)
8.	Available sodium	kg/ha	122.0	LAB-SOP-059
9.	Availablepotassium	kg/ha	114.0	LAB-SOP-060
10.	Available calcium	mg/100g	102.0	LAB-SOP-061
11.	AvailableMagnsium	mg/100g	16.56	LAB-SOP-062
12.	Nitrate Nitrogen	%	0.078	14684:1999(RA-2014)
13.	Total Phosphate	kg/ha	44.66	LAB-SOP-063
14.	Cadmium	Mg/kg	1.12	USEPA3050B
15.	Copper	Mg/kg	166.0	USEPA3050B
16.	Lead	Mg/kg	1.26	USEPA3050B

Remarks:

Jaya

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

17	Manganese	Mg/kg	2.24	USEPA3050B
18	Zinc	Mg/kg	226.0	USEPA3050B
19	Iron	Mg/kg	2024	USEPA3050B
20	Boron	Mg/kg	<0.5	LAB SOP-96
21	CEC(Cationexchange Capacity)	Meq/100gm	26.52	LAB SOP-085
22	Organic Carbone	%	0.80	Is :2720 (part-22)
23	Available Nitrogen	%	0.084	LAB SOP-95
24	Available phosphorus	Kg/ha	38.56	LAB SOP-94
25	ESP(Exchangeable Sodium Percentage)	%	6.48	LAB SOP-085
26	Texture:	Clay Sandy loam		Is :-2720(part-4)
27	(sand)	%	22.36	Is :-2720(part-4)
28	silt	%	9.22	Is :-2720(part-4)
29	clay	%	68.42	Is :-2720(part-4)

Remarks:

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Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client : M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060DEC20SS03	3	Reporting Date: 25/12/2020
4.	Location:- Kokdilla Pachgaon, Tehsil-Manesar, District Gurugram(Haryana)		
5.	Sampling Date: -16/12/2020	6.	Sample Drawn By: OTH&RC Team
7.	Analysis Commenced Date :- 20/12/2020	8.	Analysis completed on: 25/12/2020
9.	Season: WINTER	10.	Packing Condition & Quantity: 2.0 kg

TEST RESULTS(SOIL TEST)

S.No	Parameters	Unit (SI)	Results	Method Used
1.	pH		7.82	Is 2720 (part-26)1987(RA-2011)
2.	Conductivity	mS/m	48.0	Is :14767 (RA-2010)
3.	Moisture content	%	3.62	Is:2720 (part-2)1973 (RA-2010)
4.	WHC	%	32.55	LAB-SOP-049
5.	Specific Gravity	-	2.58	Is:2720 (part-3)
6.	Porosity	%	33.85	IS 2720 (part-7)1980(RA-2010)
7.	Bulk density	gm/ml	1.74	Is:1462 1985(RA-2006)
8.	Available sodium	kg/ha	132.6	LAB-SOP-059
9.	Available potassium	kg/ha	102.4	LAB-SOP-060
10.	Available calcium	mg/100g	126.4	LAB-SOP-061
11.	Available Magnesium	mg/100g	32.64	LAB-SOP-062
12.	Nitrate Nitrogen	%	0.068	14684:1999(RA-2014)
13.	Total Phosphate	kg/ha	42.36	LAB-SOP-063
14.	Cadmium	Mg/kg	1.42	USEPA3050B
15.	Copper	Mg/kg	132.0	USEPA3050B
16.	Lead	Mg/kg	1.16	USEPA3050B
17.	Manganese	Mg/kg	2.18	USEPA3050B

Remarks:

Jaya

Analyst:



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18	Zinc	Mg/kg	142.0	USEPA3050B
19	Iron	Mg/kg	1954	USEPA3050B
20	Boron	Mg/kg	<0.5	LAB SOP-96
21	CEC(Cationexchange Cap	Meq/100gr	27.92	LAB SOP-085
22	Organic Carbone	%	0.78	Is :2720 (part-22)
23	Available Nitrogen	%	0.088	LAB SOP-95
24	Available phosphorus	Kg/ha	47.56	LAB SOP-94
25	ESP(Exchangeable Sodium Percentage)	%	6.74	LAB SOP-085
26	Texture	Clay Sandy loam		Is :-2720(part-4)
27	(sand)	%	24.62	Is :-2720(part-4)
28	silt	%	13.14	Is :-2720(part-4)
29	clay	%	62.24	Is :-2720(part-4)

Remarks:

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Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: : - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060DEC20SS04	3	Reporting Date: 25/12/2020
4	Location:- Near Farukhnagar ,District-Gurugram(haryana)		
5.	Sampling Date: -15/12/2020	6.	Sample Drawn By: OTH&RC Team
7.	Analysis Commenced Date :- 20/12/2020	8.	Analysis completed on: 25/12/2020
9	Season: WINTER	10.	Packing Condition & Quantity: 2.0 kg

TEST RESULTS(SOIL TEST)

S.No	Parameters	Unit (SI)	Results	Method Used
1.	pH		7.84	Is 2720 (part-26)1987(RA-2011)
2.	Conductivity	mS/m	44.0	Is :14767 (RA-2010)
3.	Moisture content	%	3.62	Is:2720 (part-2)1973 (RA-2010)
4.	WHC	%	29.82	LAB-SOP-049
5.	Specific Gravity	-	2.56	Is:2720 (part-3)
6.	Porosity	%	34.38	IS 2720 (part-7)1980(RA-2010)
7.	Bulk density	gm/ml	1.68	Is:1462 1985(RA-2006)
8.	Available sodium	kg/ha	120.0	LAB-SOP-059
9.	Availablepotassium	kg/ha	136.0	LAB-SOP-060
10.	Available calcium	mg/100g	124.0	LAB-SOP-061
11	AvailableMagnsium	mg/100g	24.0	LAB-SOP-062
12	Nitrate Nitrogen	%	0.082	14684:1999(RA-2014)
13	Total Phosphate	kg/ha	44.68	LAB-SOP-063
14	Cadmium	Mg/kg	1.44	USEPA3050B
15	Copper	Mg/kg	226.0	USEPA3050B
16	Lead	Mg/kg	0.94	USEPA3050B

Remarks:

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Analyst:



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Certificate No.: TC-5165

17	Manganese	Mg/kg	2.18	USEPA3050B
18	Zinc	Mg/kg	136.0	USEPA3050B
19	Iron	Mg/kg	1980	USEPA3050B
20	Boron	Mg/kg	<0.5	LAB SOP-96
21	CEC(Cationexchange Capacity)	Meq/100gm	28.92	LAB SOP-085
22	Organic Carbone	%	0.76	Is :2720 (part-22)
23	Available Nitrogen	%	3.24	LAB SOP-95
24	Available phosphorus	Kg/ha	38.62	LAB SOP-94
25	ESP(Exchangeable Sodium Percentage)	%	7.60	LAB SOP-085
26	Texture:	Sandy Clay Loam		Is :-2720(part-4)
27	sand	%	56.42	Is :-2720(part-4)
28	silt	%	10.94	Is :-2720(part-4)
29	clay	%	32.64	Is :-2720(part-4)

Remarks:

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Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060DEC20SS05	3	Reporting Date: 25/12/2020
4.	Location:- Near village- Bhopanai , Tehsil- Badli, District-Jhajjr(Haryana)		
5.	Sampling Date: -16/12/2020	6.	Sample Drawn By: OTH&RC Team
7.	Analysis Commenced Date :- 20/12/2020	8.	Analysis completed on: 25/12/2020
9.	Season: WINTER	10.	Packing Condition & Quantity: 2.0 kg

TEST RESULTS(SOIL TEST)

S.No	Parameters	Unit (SI)	Results	Method Used
1.	pH		7.68	Is 2720 (part-26)1987(RA-2011)
2.	Conductivity	mS/m	42.0	Is :14767-2000 (RA-2010)
3.	Moisture content	%	3.52	Is:2720 (part-2)1973 (RA-2010)
4.	WHC	%	31.62	LAB-SOP-049
5.	Specific Gravity	-	2.62	Is:2720 (part-3)
6.	Porosity	%	34.35	IS 2720 (part-7)1980(RA-2010)
7.	Bulk density	gm/ml	1.72	Is:1462 1985(RA-2006)
8.	Available sodium	kg/ha	122.0	LAB-SOP-059
9.	Available potassium	kg/ha	104.0	LAB-SOP-060
10.	Available calcium	mg/100g	110.0	LAB-SOP-061
11.	Available Magnesium	mg/100g	22.34	LAB-SOP-062
12.	Nitrate Nitrogen	%	0.082	14684:1999(RA-2014)
13.	Total Phosphate	kg/ha	48.52	LAB-SOP-063
14.	Cadmium	Mg/kg	1.62	USEPA3050B
15.	Copper	Mg/kg	176.0	USEPA3050B
16.	Lead	Mg/kg	1.24	USEPA3050B
17.	Manganese	Mg/kg	1.16	USEPA3050B

Remarks:

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Analyst:



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18	Zinc	Mg/kg	210.0	USEPA3050B
19	Iron	Mg/kg	2066	USEPA3050B
20	Boron	Mg/kg	<0.5	LAB SOP-96
21	CEC(Cationexchange	Meq/100gm	28.42	LAB SOP-085
22	Organic Carbone	%	0.76	Is :2720 (part-22)
23	Available Nitrogen	%	0.078	LAB SOP-95
24	Available phosphorus	Kg/ha	38.46	LAB SOP-94
25	ESP(Exchangeable	%	7.18	LAB SOP-085
26	Texture	Sandy Clay Loam		Is :-2720(part-4)
27	SAND	%	62.34	Is :-2720(part-4)
28	Slit	%	5.02	Is :-2720(part-4)
29	Clay	%	32.64	Is :-2720(part-4)

Remarks:

Jaya

Analyst:



Authorized Signatory:

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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID;- 060DEC20SS06	3	Reporting Date: 25/12/2020
4	Location:- Mountain area near starting point of tunnel, Tehsil –sohna, District-Gurugram (Haryana)		
5.	Sampling Date: -16/12/2020	6.	Sample Drawn By: OTH&RC Team
7.	Analysis Commenced Date :- 20/12/2020	8.	Analysis completed on: 25/12/2020
9	Season: WINTER	10.	Packing Condition & Quantity: 2.0 kg

TEST RESULTS(SOIL TEST)

S.No	Parameters	Unit (SI)	Results	Method Used
1.	p ^H		7.88	Is 2720 (part-26)1987(RA-2011)
2.	Conductivity	mS/m	46.0	Is :14767-2000 (RA-2010)
3.	Moisture content	%	4.32	Is:2720 (part-2)1973 (RA-2010)
4.	WHC	%	32.6	LAB-SOP-049
5.	Specific Gravity	-	2.58	Is:2720 (part-3)
6.	Porosity	%	33.33	IS 2720 (part-7)1980(RA-2010)
7.	Bulk density	gm/ml	1.72	Is:1462 1985(RA-2006)
8.	Available sodium	kg/ha	138.0	LAB-SOP-059
9.	Available potassium	kg/ha	82.0	LAB-SOP-060
10.	Available calcium	mg/100g	116.0	LAB-SOP-061
11	Available Magnesium	mg/100g	22.6	LAB-SOP-062
12	Nitrate Nitrogen	%	0.064	14684:1999(RA-2014)
13	Total Phosphate	kg/ha	40.56	LAB-SOP-063
14	Cadmium	Mg/kg	1.26	USEPA3050B
15	Copper	Mg/kg	184.0	USEPA3050B
16	Lead	Mg/kg	1.64	USEPA3050B
17	Manganese	Mg/kg	1.64	USEPA3050B
18	Zinc	Mg/kg	218	USEPA3050B

Remarks:

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Analyst:



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19	Iron	Mg/kg	2484	USEPA3050B
20	Boron	Mg/kg	<0.5	LAB SOP-96
21	CEC(Cationexchange	Meq/100gm	29.82	LAB SOP-085
22	Organic Carbone	%	0.82	Is :2720 (part-22)
23	Available Nitrogen	%	0.076	LAB SOP-95
24	Available phosphorus	Kg/ha	40.6	LAB SOP-94
25	ESP(Exchangeable	%	5.62	LAB SOP-085
26	Texture	Clay Sandy Loam		Is :-2720(part-4)
27	(sand)	%	66.84	Is :-2720(part-4)
28	silt	%	14.84	Is :-2720(part-4)
29	clay	%	18.32	Is :-2720(part-4)

Remarks:

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Analyst:



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Certificate No.: TC-5165

TEST REPORT

1.	Name & Address of Client: - M/S :- HARYANA RAIL INFRA-STRUCTURE DEVELOPMENT CORPORATION LTD Plot.no.143, 5 th floor Rail tower Sector.44 Guru gram . Haryana		
2.	Sample ID: 060DEC20SS07	3	Reporting Date: 25/12/2020
4	Location:- Forest area near Town Kharkhoda, District-sonipt(Haryana)		
5.	Sampling Date: -17/12/2020	6.	Sample Drawn By: OTH&RC Team
7.	Analysis Commenced Date :- 20/12/2020	8.	Analysis completed on: 25/12/2020
9	Season: WINTER	10.	Packing Condition & Quantity: 2.0 kg

TEST RESULTS(SOIL TEST)

S.No	Parameters	Unit (SI)	Results	Method Used
1.	pH		7.82	Is 2720 (part-26)1987(RA-2011)
2.	Conductivity	mS/m	40.0	Is :14767-2000 (RA-2010)
3.	Moisture content	%	3.36	Is:2720 (part-2)1973 (RA-2010)
4.	WHC	%	33.4	LAB-SOP-049
5.	Specific Gravity	-	2.59	Is:2720 (part-3)
6.	Porosity	%	34.36	IS 2720 (part-7)1980(RA-2010)
7.	Bulk density	gm/ml	1.70	Is:1462 1985(RA-2006)
8.	Available sodium	kg/ha	142.0	LAB-SOP-059
9.	Available potassium	kg/ha	88.0	LAB-SOP-060
10.	Available calcium	mg/100g	122.0	LAB-SOP-061
11	Available Magnesium	mg/100g	24.8	LAB-SOP-062
12	Nitrate Nitrogen	%	0.068	14684:1999(RA-2014)
13	Total Phosphate	kg/ha	39.82	LAB-SOP-063
14	Cadmium	Mg/kg	1.32	USEPA3050B
15	Copper	Mg/kg	186.0	USEPA3050B
16	Lead	Mg/kg	1.72	USEPA3050B
17	Manganese	Mg/kg	1.68	USEPA3050B
18	Zinc	Mg/kg	216.0	USEPA3050B

Remarks:

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Certificate No.: TC-5165

19	Iron	Mg/kg	2682	USEPA3050B
20	Boron	Mg/kg	<0.5	LAB SOP-96
21	CEC(Cationexchange	Meq/100gm	28.62	LAB SOP-085
22	Organic Carbone	%	0.86	Is :2720 (part-22)
23	Available Nitrogen	%	0.072	LAB SOP-95
24	Available phosphorus	Kg/ha	42.6	LAB SOP-94
25	ESP(Exchangeable	%	6.52	LAB SOP-085
26	Texture	Sandy Clay Loam		Is :-2720(part-4)
27	(sand)	%	58.24	Is :-2720(part-4)
28	silt	%	18.32	Is :-2720(part-4)
29	clay	%	23.44	Is :-2720(part-4)

Remarks:

Jaya

Analyst:



Authorized Signatory:

- NOTE : 1) Reports may be reproduced, if required, but only in full and only with written approval of the laboratory.
2) Re analysis of sample will be done, if requested within 15 days from the date of Reporting of sample if the samples are not consumed during analysis.

3) All disputes subject to Jaipur Jurisdiction and our liability is limited to invoiced value only.



Lab Address: 19A, Shivpuri Colony Extension, Jeen Mata Marg, Jhotwara, Jaipur – 302015

Tel: +91-141-2466766, E-mail: overseastesthouse@gmail.com,





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Certificate No.: TC-5165

Annexure 4.5

Calculated data for Hourly Noise monitoring for proposed HORC Project

VILLAGE: PRITHLA

Monitoring Date: 12-13/12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	60.2	62.4	61.7	62.9	61.3	62.4	62.5	60.6	60.4	62.3	61.6	60.7	60.20	72.5	62.9
07:00AM-08:00AM	62.4	60.3	61.5	62.2	60.6	62.7	61.5	60.8	62.4	61.9	60.6	62.9	60.30	72.5	62.9
08:00AM-09:00AM	61.9	62.7	60.4	61.5	62.8	61.3	60.2	62.4	60.1	61.5	62.9	60.7	60.10	72.4	62.9
09:00AM-10:00AM	62.9	60.7	61.3	60.4	62.7	61.9	60.8	62.4	60.7	62.2	61.5	60.6	60.40	72.4	62.9
10:00AM-11:00AM	60.3	61.9	62.7	60.8	61.7	62.5	61.9	60.6	62.1	60.9	61.1	62.3	60.30	72.4	62.7
11:00AM-12:00PM	61.5	60.3	62.4	61.4	62.3	60.6	62.2	61.7	60.4	62.4	60.7	61.8	60.30	72.3	62.4
12:00PM-01:00PM	60.2	62.4	61.5	62.3	60.2	62.4	61.1	62.4	60.6	62.7	61.5	60.4	60.20	72.4	62.7
01:00PM-02:00PM	61.4	60.3	62.7	60.2	61.4	60.8	62.4	60.5	61.5	60.6	62.7	61.5	60.20	72.2	62.7
02:00PM-03:00PM	62.6	61.8	60.8	61.4	62.6	61.6	60.5	61.2	62.8	61.5	60.9	62.8	60.50	72.6	62.8
03:00PM-04:00PM	61.7	62.7	61.6	62.1	60.8	62.4	61.7	62.1	60.9	62.4	61.1	60.9	60.80	72.5	62.7
04:00PM-05:00PM	60.8	61.6	62.4	60.5	62.9	61.3	62.9	60.4	61.7	60.3	62.8	61.4	60.30	72.5	62.9
05:00PM-06:00PM	62.3	60.5	61.3	61.6	60.7	62.5	60.7	61.3	62.3	61.2	60.7	62.2	60.50	72.3	62.5
06:00PM-07:00PM	61.2	62.3	60.1	62.8	61.5	60.7	61.9	62.5	60.1	62.1	61.3	60.1	60.10	72.3	62.8
07:00PM-08:00PM	62.1	60.2	62.2	61.9	62.3	61.9	62.3	60.4	61.2	60.5	62.4	61.5	60.20	72.4	62.4
08:00PM-09:00PM	60.2	61.1	60.4	62.7	60.1	62.2	60.4	61.2	62.4	61.7	60.5	62.4	60.10	72.2	62.7
09:00PM-10:00PM	61.4	62.4	61.5	60.4	61.4	60.1	61.2	62.1	60.5	62.2	61.1	60.2	60.10	72.1	62.4

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	56.2	58.9	56.2	57.1	58.2	57.5	55.4	58.2	57.7	58.5	56.4	57.7	55.4	58.2	58.9
11:00PM-12:00AM	58.3	57.8	57.4	56.5	57.4	56.3	58.2	57.8	56.8	57.7	58.2	58.2	56.3	58.4	58.3
12:00AM-01:00AM	57.4	56.4	57.5	58.7	56.1	58.4	57.5	56.4	58.4	56.6	57.5	58.8	56.1	58.4	58.8
01:00AM-02:00AM	58.1	57.2	58.7	56.9	57.7	56.8	58.6	57.6	56.5	57.5	56.7	57.4	56.5	58.3	58.7
02:00AM-03:00AM	56.2	58.1	56.6	57.7	58.4	57.7	56.1	58.5	57.9	58.8	57.4	58.9	56.1	58.6	58.9
03:00AM-04:00AM	57.4	56.5	57.8	58.5	56.3	58.9	57.6	56.3	58.2	57.9	58.2	56.2	56.2	58.4	58.9
04:00AM-05:00AM	58	57.4	58.9	56.7	57.2	56.5	58.4	57.2	56.1	58.7	56.1	57.4	56.1	58.3	58.9
05:00AM-06:00AM	56.7	58.3	58.4	57.1	58.1	57.6	56.2	58.1	57.4	56.1	57.6	58.8	56.1	58.4	58.8



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Certificate No.: TC-5165

VILLAGE: SULTANPUR

Monitoring Date: 13-14/12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	52.5	53.2	52.4	53.5	52.9	53.6	52.6	53.7	52.2	53	52.9	53.4	52.20	63.8	53.7
07:00AM-08:00AM	53.2	52.4	53.9	52.7	53.4	52.8	53.4	52.8	53.4	52.6	53.7	52.6	52.40	63.9	53.9
08:00AM-09:00AM	52.2	53.4	52.2	53.8	52.2	53.7	52.2	53.1	52.5	53.4	52.6	53.4	52.20	63.7	53.8
09:00AM-10:00AM	53.4	52.6	53.6	52.9	53.1	52.5	53.1	52.2	53.3	52.2	53.2	52.2	52.20	63.7	53.6
10:00AM-11:00AM	52.6	53.2	52.4	53.2	52.5	53.2	52.9	53.4	52.1	53.1	52.5	53.1	52.10	63.7	53.4
11:00AM-12:00PM	53	52.4	53	52.1	53.7	52.1	53.8	52.7	53.8	52.9	53.7	52.4	52.10	63.8	53.8
12:00PM-01:00PM	53.4	52.8	53.5	52.7	53	52.2	53.1	52.7	53	52.1	53.9	58.7	52.10	64.7	58.7
01:00PM-02:00PM	52.2	53.7	52.6	53.8	52.8	53.1	52.6	53.6	52.2	53.4	52.7	53	53.8	63.8	53.8
02:00PM-03:00PM	53.1	52.4	53.4	52.4	53.9	52.6	53.4	52.5	53.4	52.2	53.5	52.6	52.20	63.8	53.9
03:00PM-04:00PM	52.7	53.3	52.6	53.2	52.4	53.9	52.2	53	52.8	53	52.1	53.9	52.10	63.8	53.9
04:00PM-05:00PM	53.9	52.2	53.8	52.6	53	52.4	53.6	52.9	53.4	52.7	53.4	52.6	52.20	63.9	53.9
05:00PM-06:00PM	52.8	53.5	52.6	53.1	52.2	53.2	52.9	53.4	52.3	53.9	52.3	53.7	52.20	63.8	53.9
06:00PM-07:00PM	53.2	52.4	53.7	52.6	53.1	52.4	53.8	52.2	53.1	52.8	53.4	52.8	52.20	63.8	53.8
07:00PM-08:00PM	52.4	53.2	52.2	53	52.3	53.8	52.6	53.4	52.2	53.2	52.9	53.4	52.20	63.7	53.8
08:00PM-09:00PM	53.1	52.4	53.4	52.6	53.8	52.7	53	52.9	53.4	52.9	53	52.2	52.20	63.8	53.8
09:00PM-10:00PM	52.2	53.9	52.1	53	52.7	53.4	52.6	53	52.6	53.4	52.8	53	52.10	63.7	53.9

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	42.5	43.1	42.9	43.4	42.9	43.2	42.9	43.7	42	43.2	42.9	43.2	42.0	43.8	43.7
11:00PM-12:00AM	43.4	42.4	43.2	42.9	43.4	42.4	43.8	42.6	43	42.9	43.5	42.8	42.4	43.8	43.8
12:00AM-01:00AM	42.6	43.2	42.8	43.2	42.2	43.2	42.2	43.5	42.9	43.2	42.9	43.1	42.2	43.7	43.5
01:00AM-02:00AM	43.4	42.8	43.9	42.6	43.2	42.9	43.1	42.9	43	42.9	43.2	42.9	42.6	43.9	43.9
02:00AM-03:00AM	42.3	43.3	42.4	43.2	42.6	43.2	42.5	43.8	42.6	43.4	42.1	43.2	42.1	43.7	43.8
03:00AM-04:00AM	43.2	42.2	43.5	42.6	43.2	42.1	43.7	42.6	43	42.9	43.8	42.9	42.1	43.8	43.8
04:00AM-05:00AM	42.1	43.1	42.9	43.2	42.9	43.8	42.6	43.1	42.9	43.8	42.4	43.2	42.1	43.8	43.8
05:00AM-06:00AM	43.4	42.4	43.6	42.8	43	42.9	43.2	42.6	43	42.9	43.2	41.8	41.8	43.7	43.6



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Certificate No.: TC-5165

VILLAGE: ASAUDHA TODRAN

Monitoring Date: 23-24/12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	54.1	53	54	54.5	53.9	54.2	53.5	53.1	54.2	54.1	54	53.2	53.00	64.6	54.5
07:00AM-08:00AM	54.2	53.7	54.7	54.1	54.1	54.8	54.7	54.7	54.8	54.3	53.8	54.6	53.70	65.2	54.8
08:00AM-09:00AM	53.8	54.1	54.1	53.9	54.7	54.6	54.8	54.6	53.7	53.5	54.9	54.9	53.50	65.1	54.9
09:00AM-10:00AM	54.7	53.8	53.8	53.6	54.8	53.9	54.3	53.7	54.5	53.9	53.7	54.8	53.60	64.9	54.8
10:00AM-11:00AM	54.7	54.9	54.5	54.4	53.5	53.7	53.9	53.9	53.5	54.2	54.8	53.8	53.50	65.0	54.9
11:00AM-12:00PM	53.9	54.5	54.9	54.8	53.2	54.6	53.2	54.1	54.8	54.3	53.1	53.3	53.10	65.0	54.9
12:00PM-01:00PM	54.3	53.8	53.9	54.3	54.7	53.9	53	54.3	54.1	53.2	54.6	54.9	53.00	64.9	54.9
01:00PM-02:00PM	54.7	54.3	54.6	53.8	53.9	54.1	54.7	53.2	53.3	54.4	54.5	53.7	53.8	64.9	54.7
02:00PM-03:00PM	53.9	53.1	53.2	54.6	53.1	53.5	54.5	54.9	54	53.9	54.1	54.4	53.10	64.8	54.9
03:00PM-04:00PM	53.6	54.8	54.6	53.9	53.5	53.9	54.1	54.6	53.9	54.5	54.3	53.6	53.50	64.9	54.8
04:00PM-05:00PM	53.5	53.9	54.1	54.5	54.4	53.3	54.5	53.5	53.8	54.7	53.7	54.3	53.30	64.8	54.7
05:00PM-06:00PM	54.6	54.1	53.9	53.2	54.5	54.7	53.8	53.9	53	54.9	54.6	53.7	53.00	64.9	54.9
06:00PM-07:00PM	53.3	54.6	54.9	53.1	53.9	53.7	54.5	54.2	54.9	53.7	53.8	54.2	53.10	64.9	54.9
07:00PM-08:00PM	53.9	53.4	54.5	54.6	53.4	54.7	54.8	53.8	54.4	53.9	54.5	53.1	53.10	64.9	54.8
08:00PM-09:00PM	53	54.5	54.1	53.8	53.5	53.2	54.3	54.6	53.9	54	53.9	54.5	53.00	64.8	54.6
09:00PM-10:00PM	54.3	54.7	54.2	53.2	53.8	54.7	54.9	53	54.1	53.3	53.1	54.9	53.00	64.9	54.9
NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	44.6	43.2	43.9	44.2	43.1	44.6	44.7	43.9	44.2	44.1	43.7	43.6	43.1	44.8	44.7
11:00PM-12:00AM	43.2	43.9	44.6	44.8	43.7	43.8	43.5	44	44.4	43.6	44.8	44.1	43.2	44.9	44.8
12:00AM-01:00AM	43.9	44.3	43.5	43.2	44.7	44.9	43.8	43.9	44.8	44.2	44.5	43.3	43.2	44.9	44.9
01:00AM-02:00AM	44.3	43.1	43.7	44.9	44	43.8	43.5	44.6	44.4	44.7	43.1	43.7	43.1	44.8	44.9
02:00AM-03:00AM	43.4	44.3	44.8	43.7	43.3	44.3	44.6	43.8	43.1	43.5	44.1	44.7	43.1	44.8	44.8
03:00AM-04:00AM	44.7	43.1	44.1	44.7	43.9	43.6	44.8	43.5	44.7	43.7	43.2	44.3	43.1	44.9	44.8
04:00AM-05:00AM	43.4	44.5	44.9	43.1	43.7	44.5	43.2	44.5	43.7	44.9	43.1	44.8	43.1	44.9	44.9
05:00AM-06:00AM	44.5	43.7	43.8	44.2	44.5	43.6	44.9	43	44.1	43.8	44.5	43.3	43.0	44.8	44.9



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Certificate No.: TC-5165

VILAGE: FARUKH NAGAR TOWN

Monitoring Date: 17-18 /12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	51.2	52.4	51.2	52.2	51.2	52.6	51.8	52.6	51.6	52.7	51.9	52.3	51.20	62.8	52.7
07:00AM-08:00AM	51.9	52.6	51.6	52.7	51.6	52.4	51.7	52.1	51.5	52.3	51.7	52.1	51.50	62.8	52.7
08:00AM-09:00AM	52.3	51.6	52.3	51.9	52.5	51.3	52.4	51.4	52.7	51.5	52.6	51.6	51.30	62.8	52.7
09:00AM-10:00AM	51.2	52.3	52.5	52.8	51.9	52.8	51.2	52.6	52.3	52.6	51.3	51.5	51.20	62.9	52.8
10:00AM-11:00AM	52.7	51.8	51.3	52.9	52.3	51.4	52.3	51.9	52.2	51.7	52.4	52.1	51.30	62.9	52.9
11:00AM-12:00PM	52.3	51.6	52.6	52.4	51.7	52.6	51.8	52.6	52.7	51.2	52.7	51.3	51.20	62.9	52.7
12:00PM-01:00PM	51.6	52.3	51.6	52.7	51.7	52.6	51.2	52.8	51.6	52.6	51.2	52.6	51.20	62.9	52.8
01:00PM-02:00PM	52.3	52.7	51.4	51.6	51.5	52.8	52.6	51.3	52.6	51.9	52.8	51.6	53.8	62.9	52.8
02:00PM-03:00PM	51.9	51.3	52.3	51.8	52.6	51.1	51.9	52.2	52.7	51.5	52.8	52.8	51.10	62.9	52.8
03:00PM-04:00PM	51.7	52.8	51.5	52.6	51.9	52.5	51.7	51.1	51.3	52.2	51.7	52.7	51.10	62.8	52.8
04:00PM-05:00PM	52.6	52.6	52.9	51.3	52.6	51.4	52.7	51.6	51.2	51.6	51.3	51.8	51.20	62.8	52.9
05:00PM-06:00PM	51.2	51.4	52.7	51.2	52.8	51.6	52.3	52.6	52.5	52.1	52.2	52.4	51.20	62.9	52.8
06:00PM-07:00PM	51.3	52.3	51.8	52.3	51.2	52.8	51.3	52.8	51.6	52.6	51.2	52.3	51.20	62.8	52.8
07:00PM-08:00PM	52.6	51.9	51.6	51.9	52.6	51.7	51.9	51.3	52.6	52.8	52.3	51.9	51.30	62.9	52.8
08:00PM-09:00PM	51.5	52.2	52.6	52.5	52.3	51.4	52.1	51.6	51.7	51.2	52.8	51.3	51.20	62.8	52.8
09:00PM-10:00PM	51.2	52.1	51.6	52.2	51.1	52.3	51.8	52.8	51.4	52.3	51.6	52.7	51.10	62.8	52.8

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	42.7	42.1	42.6	42.1	42.8	42.3	42.8	42.4	42.3	42.4	42.3	42.3	42.1	43.2	42.8
11:00PM-12:00AM	42.1	42.3	42.8	42.6	42.5	42.4	42.2	42.3	42.1	42.1	42.7	42.7	42.1	43.2	42.8
12:00AM-01:00AM	42.8	42.7	42.5	42.8	42.5	42.3	42.8	42.6	42.2	42.3	42.3	42.1	42.1	43.3	42.8
01:00AM-02:00AM	42.5	42.8	42.4	42.7	42.8	42.1	42.2	42.1	42.6	42.5	42.8	42.2	42.1	43.3	42.8
02:00AM-03:00AM	42.4	42.7	42.3	42.6	42.4	42.4	42.3	42.7	42.8	42.4	42.5	42.6	42.3	43.3	42.8
03:00AM-04:00AM	42.8	42.1	42.6	42.1	42.1	42.6	42.1	42.1	42.7	42.3	42.1	42.9	42.1	43.2	42.9
04:00AM-05:00AM	42.3	42.5	42.8	42.3	42.6	42.1	42.7	42.8	42.1	42.1	42.6	42.9	42.1	43.3	42.9
05:00AM-06:00AM	42.2	42.7	42.5	42.4	42.4	42.7	42.7	42.3	42.3	42.4	42.7	42.8	42.2	43.3	42.8



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Certificate No.: TC-5165

VILAGE: FAZALWAS

Monitoring Date: 14-15/12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	54.2	53.8	53.8	54.3	54.3	54.3	53.8	54.6	54.3	54.3	53.6	54.2	53.60	64.9	54.6
07:00AM-08:00AM	53.4	54.2	54.7	53.5	54.2	53.4	54.3	53.8	54.6	53.6	53.8	53.3	53.30	64.7	54.7
08:00AM-09:00AM	54.3	53.3	54.8	53.4	53.4	54.6	53.8	54.3	54.7	53.7	54.3	53.4	53.30	64.8	54.8
09:00AM-10:00AM	54.4	53.4	53.3	54.6	54.2	53.8	53.5	54.2	53.3	54.2	53.4	54.4	53.30	64.7	54.6
10:00AM-11:00AM	53.5	54.5	54.5	53.8	54.6	53.3	54.6	54.5	53.4	53.2	53.8	53.6	53.20	64.8	54.6
11:00AM-12:00PM	54.6	53.6	53.6	54.2	53.8	54.5	53.8	53.6	54.6	53.3	54.6	54.5	53.30	64.8	54.6
12:00PM-01:00PM	53.2	53.5	54.5	54.3	54.6	53.8	53.3	54.3	54.6	53.6	54.6	54.3	53.20	64.9	54.6
01:00PM-02:00PM	54.3	53.6	53.6	53.4	53.2	54.6	53.4	53.2	53.2	54.7	53.3	53.7	53.8	64.5	54.7
02:00PM-03:00PM	53.2	54.7	53.7	54.9	53.3	54.7	54.2	53.8	53.4	54.8	54.2	54.6	53.20	65.0	54.9
03:00PM-04:00PM	54.4	53.3	54.2	53.8	54.2	53.3	53.3	54.2	54.6	54.9	53.6	53.8	53.30	64.8	54.9
04:00PM-05:00PM	53.1	53.8	53.4	54.2	53.6	54.6	53.5	54.6	53.3	53.8	53.4	54.2	53.10	64.6	54.6
05:00PM-06:00PM	54.2	54.3	54.6	54.2	53.2	53.4	54.2	53.3	53.6	54.2	53.7	53.3	53.20	64.7	54.6
06:00PM-07:00PM	53.2	53.2	54.2	53.3	54.3	53.2	53.6	53.8	54.7	53.2	54.3	53.4	53.20	64.5	54.7
07:00PM-08:00PM	53.8	54.3	53.3	53.4	53.6	54.6	53.3	54.6	54.2	53.4	53.9	54.6	53.30	64.7	54.6
08:00PM-09:00PM	54.3	53.4	54.8	54.6	53.2	53.8	54.6	53.4	53.2	53.6	53.8	54.2	53.20	64.7	54.8
09:00PM-10:00PM	53.4	54.5	54.9	53.2	54.3	54.9	53.7	54.2	53.6	54.7	54.6	54.6	53.20	65.0	54.9

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	42.8	43.6	43.6	42	43.3	42.3	43.4	43.1	42.6	43.3	42.6	43.6	42.0	43.8	43.6
11:00PM-12:00AM	43.1	42.3	43	43.2	42.2	43.2	42.8	43.3	43.7	43.5	43.3	43.7	42.2	43.9	43.7
12:00AM-01:00AM	43.2	43.7	42.2	42.8	43.6	43.5	43.3	42.4	43.3	42.6	43	42.8	42.2	43.8	43.7
01:00AM-02:00AM	42.3	43.9	43.3	43.3	43	42.8	43.5	43.5	43.4	42.2	42.7	43.6	42.2	43.9	43.9
02:00AM-03:00AM	43.2	42.7	43.4	42.2	42.7	43.2	43	43.2	42.5	43.3	43.3	43.4	42.2	43.8	43.4
03:00AM-04:00AM	42.6	43	42.5	43.2	43.3	43.1	42.6	43.7	43	42.8	43.6	42	42.0	43.8	43.7
04:00AM-05:00AM	43.2	42	43.6	42	42.6	42.3	43.3	42.3	43.6	43.6	43.2	43.2	42.0	43.7	43.6
05:00AM-06:00AM	42.3	43	42.7	43	43	43	43.5	43.2	42.7	43.7	43.3	42.8	42.3	43.8	43.7



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Certificate No.: TC-5165

HARSANA KALAN

Monitoring Date: 24-25/12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	52.8	52.6	52.9	51.3	51.4	52.3	51.8	52.7	51.2	51.3	52.7	51.6	51.20	62.9	52.9
07:00AM-08:00AM	51.3	51.9	52.2	52.1	52.7	51.2	51.1	51.6	52.9	52.3	51.8	52.1	51.10	62.8	52.9
08:00AM-09:00AM	51.7	52.3	51.6	51.9	52.8	51.4	51.3	51.7	52.1	52.4	52.9	52.6	51.30	62.9	52.9
09:00AM-10:00AM	51.1	51.8	51.5	52.2	52.3	51.5	51.4	52.6	52.8	51.9	52.7	52.3	51.10	62.8	52.8
10:00AM-11:00AM	52.3	52.1	51.2	51.9	51.2	51.3	52.2	52.3	52.4	51.3	51.8	51.7	51.20	62.6	52.4
11:00AM-12:00PM	52.1	52.3	52.6	51.8	51.9	52.3	51.4	52.9	51.8	51.9	52.3	51.5	51.40	62.9	52.9
12:00PM-01:00PM	51.2	51.6	52.1	51.7	51.3	52.3	52.4	51.9	51.8	51.8	52.9	52.2	51.20	62.7	52.9
01:00PM-02:00PM	52.3	51.7	51.2	51.1	52.8	51.9	51.5	52.3	52.9	52.7	51.8	52.4	51.10	62.9	52.9
02:00PM-03:00PM	51.7	52.1	52.4	51.8	51.5	51.2	52	51.7	52.3	52.4	51.3	51.7	51.20	62.7	52.4
03:00PM-04:00PM	52.6	52.8	52.5	52.3	51.2	52.4	51.3	51.1	51.3	52.8	51.9	52.3	51.10	62.9	52.8
04:00PM-05:00PM	51.8	52.1	51.7	51.8	52.7	52.1	51.4	51.9	52.5	52.3	51.8	51.5	51.40	62.8	52.7
05:00PM-06:00PM	51.7	52.9	51	51.1	52.3	52.6	51.8	52.7	51.3	51.8	52.9	51.7	51.00	62.8	52.9
06:00PM-07:00PM	52.1	51.6	52.2	51.9	52.6	52.5	52.1	51.8	51.9	52.1	52.4	52.9	51.60	63.0	52.9
07:00PM-08:00PM	51.3	52.4	52.1	52.7	51.8	52.6	52.5	51.9	52.6	52.7	52.8	51.9	51.30	63.1	52.8
08:00PM-09:00PM	52.3	51.5	51.7	52.4	51.7	51.8	52.1	52.8	52.9	51.7	52.3	52.4	51.50	62.9	52.9
09:00PM-10:00PM	51.4	51.7	52.7	52.1	52	51.3	52.2	51.5	51.1	52.6	51.7	51.8	51.10	62.7	52.7

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	43	42.1	42.3	42.6	42.1	42.7	42.1	43.7	42.5	42.9	43.3	42.9	42.1	43.5	43.7
11:00PM-12:00AM	42.2	43.4	42.9	42.7	42.8	43.1	42.3	43.1	43.7	43.1	42.4	42.1	42.1	43.6	43.7
12:00AM-01:00AM	42.1	42.5	42.1	42.8	43.1	43.5	43.1	42.7	42	43.2	43.1	43.7	42.0	43.6	43.7
01:00AM-02:00AM	43.6	42.8	43.7	42.1	42.7	42.2	43.7	42	43.9	42.5	42.2	42.5	42.0	43.7	43.9
02:00AM-03:00AM	42.9	43.1	43.1	42	42.6	42.1	43.5	43.1	43.1	43.6	43.6	43.9	42.0	43.9	43.9
03:00AM-04:00AM	43.3	43.7	42.3	42.6	42.1	43.6	42.5	43.6	42.3	42.7	43.9	43.6	42.1	43.9	43.9
04:00AM-05:00AM	43.7	42.1	43.5	42.5	42.7	43.1	42.8	43	42.1	43.8	43.1	42.8	42.1	43.8	43.8
05:00AM-06:00AM	42.1	43.4	42.3	43.1	42.5	42	43.7	43.4	42	42.9	42.9	42	42.0	43.5	43.7

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Certificate No.: TC-5165

VILAGE: KHEDI KANKAR

Monitoring Date: 16-17/12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	52.2	53.8	52.6	53.2	52.8	53.3	52.8	53.2	52.5	53.2	52.1	53.2	52.10	63.7	53.8
07:00AM-08:00AM	53.3	52.3	53.5	52.8	53.6	52.4	53.7	52.8	53.2	52.4	53.3	53.1	52.30	63.8	53.7
08:00AM-09:00AM	52.4	53.6	52.2	53.7	52.2	53.7	52.8	53.5	52.5	52.5	52.8	53.5	52.20	63.8	53.7
09:00AM-10:00AM	53.5	52.4	53.4	52.8	53.7	53.2	53.6	52.6	52.6	52.4	53.6	52.8	52.40	63.9	53.7
10:00AM-11:00AM	52.8	53.1	52.6	53.2	52.8	53.1	52.8	53.2	52.8	53.5	52.5	53.6	52.50	63.8	53.6
11:00AM-12:00PM	52.2	52.3	53.5	52.1	53.5	52.2	53.2	52.8	53.2	52.7	53.3	52.4	52.10	63.7	53.5
12:00PM-01:00PM	52.4	53.3	52.1	52.1	53.3	52.6	53.7	52.8	53.1	52.3	53.1	52.3	52.10	63.6	53.7
01:00PM-02:00PM	53.3	52.4	53.3	53.6	53.5	53.7	52.4	53.2	52.2	53.7	52.3	53.2	53.8	63.9	53.7
02:00PM-03:00PM	53.2	52.1	52.5	52.4	52.6	52.8	53.8	52.8	53.1	52.4	53.7	52.4	52.10	63.6	53.8
03:00PM-04:00PM	52.8	53.3	52.5	53.2	53.2	53.2	53.3	53.3	53.3	52.9	52.8	53.5	52.50	63.9	53.5
04:00PM-05:00PM	53.1	52.7	53.4	52.7	53.8	52.1	53.5	52.2	53.5	53.9	53.6	53.9	52.10	64.0	53.9
05:00PM-06:00PM	52.8	53.8	52.2	53.5	52.5	53.1	52.4	53.8	52.5	53.9	53.6	53.9	52.20	64.0	53.9
06:00PM-07:00PM	53.5	52.5	53.2	52.2	53.3	52.7	53.6	52.7	53.4	52.7	53.4	52.1	52.10	63.8	53.6
07:00PM-08:00PM	52.8	53.1	52.1	53.1	52.8	53.8	52.1	53.5	52.3	53.2	52.8	53.9	52.10	63.8	53.9
08:00PM-09:00PM	52.4	53.3	52.5	52.4	53.1	52.6	53.2	52.4	53.5	52.6	52.1	52.8	52.10	63.6	53.5
09:00PM-10:00PM	53.6	52.7	53.4	53.5	53.2	53.5	52.8	53.6	52.1	53.5	52.3	53.5	52.10	64.0	53.6

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	41.1	42.3	41.3	42	41.3	42.3	41.5	42.3	41.1	42.7	41.8	42.5	41.1	42.7	42.7
11:00PM-12:00AM	42.6	41.8	42.6	41.4	42.6	41.4	42.3	41.5	42.5	41.9	42.7	41.4	41.4	42.9	42.7
12:00AM-01:00AM	41.4	42.9	41.7	42.8	41.9	42	41.1	42.7	41.6	41.7	41.3	42.6	41.1	42.8	42.9
01:00AM-02:00AM	42.5	41.7	42	41.7	42.8	42.5	41.9	41.4	42.6	42.6	42.2	41.7	41.4	42.9	42.8
02:00AM-03:00AM	41.7	42.4	41.5	42.3	41.6	41.6	41.5	42.6	41.7	42	41.9	42	41.5	42.7	42.6
03:00AM-04:00AM	42.6	41.5	42.6	41.4	42.5	42	42.6	41.4	42.8	41.6	42.7	41.9	41.4	43.0	42.8
04:00AM-05:00AM	41.4	42.2	41.8	42.2	41.3	42.5	41.3	42.5	41.9	42.5	41.6	42.6	41.3	42.8	42.6
05:00AM-06:00AM	41.8	41.3	41.5	41.4	41.1	41.2	42	41.3	42.1	41.4	42.1	41.4	41.1	42.4	42.1



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Certificate No.: TC-5165

VILAGE: MANDOTHI

Monitoring Date: 21-22/12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	54.2	53.4	53.8	54.7	52.9	53.4	52.6	54.2	52.8	53.6	52.9	53.8	52.60	64.4	54.7
07:00AM-08:00AM	53.6	54.8	52.8	53.3	54.2	53.7	52.7	53.9	54.6	52.8	54.7	54.5	52.70	64.7	54.8
08:00AM-09:00AM	54.6	52.8	54.8	55.2	53.8	52.8	54.8	53.7	54.6	53.9	52.8	54.6	52.80	64.9	55.2
09:00AM-10:00AM	53.8	54.6	52.6	53.4	53.7	54	54.2	53.4	55	53.8	54.6	53.8	52.60	64.7	55.0
10:00AM-11:00AM	53.6	55.2	52.4	53.5	54.7	53.7	54.7	53.9	52.9	54.5	52.7	53.8	52.40	64.7	55.2
11:00AM-12:00PM	52.9	54.5	52.9	54.8	54.8	53.6	52.9	54.7	53.8	54.6	53.5	54.3	52.90	64.8	54.8
12:00PM-01:00PM	54.5	53.4	54.2	53.6	52.7	53.5	54.2	52.8	53.6	54.8	53.4	52.6	52.60	64.5	54.8
01:00PM-02:00PM	53.4	54.8	52.2	53.7	53.4	54.2	54.2	55	54	53.8	52.8	54.2	53.8	64.7	55.0
02:00PM-03:00PM	54.7	53.8	52.6	54.8	52.7	54.4	53.8	54.5	53.4	54.7	52.9	54.7	52.60	64.8	54.8
03:00PM-04:00PM	54.7	53.7	54.7	54.3	54.8	53.7	54.6	53.4	54.6	53.5	52.9	54.2	52.90	64.9	54.8
04:00PM-05:00PM	53.8	54.5	52.8	54.9	54.9	54.7	54.3	53.4	54.8	52.5	55	52.7	52.50	64.9	55.0
05:00PM-06:00PM	53.2	54.4	54.7	53.6	54.5	55.3	54.2	53.2	52	53.3	54.3	54.6	52.00	64.8	55.3
06:00PM-07:00PM	52.7	53.7	53.8	52.6	54.6	53.7	54.8	52.7	53.8	54.7	52.8	53.8	52.60	64.5	54.8
07:00PM-08:00PM	54.6	52.7	54.8	53.9	54.5	53.7	54.5	55.3	54.7	52.8	53.4	54.3	52.70	65.0	55.3
08:00PM-09:00PM	54.4	53.6	52.2	53.4	54.4	52.6	52.7	53.4	54.2	54.3	52.8	53.9	52.20	64.3	54.4
09:00PM-10:00PM	52.7	53.6	54.6	53.7	52.8	54.6	53.7	54.6	53.7	54.7	55.7	54.8	52.70	65.0	55.7

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	40.6	41.8	41.2	41.3	40.4	40.4	34.3	42.4	41.5	42.5	40.4	42	34.3	41.9	42.5
11:00PM-12:00AM	41.3	42.4	40.3	39.8	44.6	42.7	43.2	43.3	43	42.9	41.3	42.4	39.8	43.2	44.6
12:00AM-01:00AM	41.4	40.3	41.4	42.5	43.6	42.7	41.9	40.5	41.6	42	41.4	42.5	40.3	42.7	43.6
01:00AM-02:00AM	41.4	42	41.3	40.4	40.3	42.6	41.2	42.2	43.7	43.4	41.2	40.3	40.3	42.6	43.7
02:00AM-03:00AM	42.4	42.5	41.5	42.3	43	41.4	41.2	42.3	43	42.3	41.4	43	41.2	43.0	43.0
03:00AM-04:00AM	40	40.3	41.4	42.3	40.3	41.7	40.9	41.2	42.3	41.3	42.8	41.2	40.0	42.2	42.8
04:00AM-05:00AM	40.3	41.4	42.5	41.9	39.3	39	40.1	42	41.3	42	41.3	42.4	39.0	42.1	42.5
05:00AM-06:00AM	41.3	42.3	40.9	40.3	43.7	41.3	40.2	41.3	40.2	42.3	41.7	42.7	40.2	42.4	43.7



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Certificate No.: TC-5165

VILAGE: MANESWAR TOWN

Monitoring Date: 15-16/12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	52.2	54.6	52.8	53.3	54.6	52.7	54.8	54.3	53.4	52.5	54.3	52.2	52.20	64.4	54.8
07:00AM-08:00AM	54.3	52.4	53.7	53.6	54.3	53.3	53.3	52.4	53.5	54.1	54.8	52.3	52.30	64.4	54.8
08:00AM-09:00AM	53.5	53.3	52.4	54.3	52.4	54.8	52.4	54.1	52.6	52.4	53.1	52.4	52.40	64.0	54.8
09:00AM-10:00AM	54.7	54.5	54.3	53.5	52.2	53.5	54.9	54.3	53.3	53.5	52.3	54.3	52.20	64.6	54.9
10:00AM-11:00AM	53.8	53.6	53.1	54.7	53.4	54.7	53.7	52.9	54.7	54.6	54.2	53.6	52.90	64.8	54.7
11:00AM-12:00PM	52.4	53.5	52.5	52.1	52.5	52.6	52.8	53.5	52.9	52.7	53.4	52.4	52.10	63.8	53.5
12:00PM-01:00PM	54.3	53.3	52.4	52.4	54.3	53.3	54.7	54.3	53.6	54.3	52.6	53.3	52.40	64.4	54.7
01:00PM-02:00PM	53.2	54.5	54.3	53.3	52.9	54.7	54.8	54.4	53.7	53.6	54.3	54.4	53.8	64.8	54.8
02:00PM-03:00PM	53.4	54.6	53.5	54.7	54.3	52.2	53.6	53.2	53.3	54.7	52.4	54.6	52.20	64.6	54.7
03:00PM-04:00PM	54.6	53.3	53.6	53.5	53.3	54.3	53.6	54.6	52.5	54.6	53.6	54.8	52.50	64.7	54.8
04:00PM-05:00PM	52.5	52.2	54.7	53.6	53.5	52.4	53.3	53.3	54.6	53.7	54.6	53.5	52.20	64.4	54.7
05:00PM-06:00PM	53.5	54.6	53.8	52.4	53.5	54.5	52.8	53.7	52.8	52.7	52.7	52.6	52.40	64.2	54.6
06:00PM-07:00PM	54.6	53.5	52.3	54.6	54.5	54.6	52.3	52.4	53.3	54.6	52.6	54.7	52.30	64.6	54.7
07:00PM-08:00PM	52.4	52.8	54.9	53.7	53.3	54.7	53.4	54.9	53.6	53.8	53.6	53.6	52.40	64.6	54.9
08:00PM-09:00PM	53.7	54.7	53.5	53.8	52.2	52.8	54.5	52.7	52.7	52.9	53.7	53.4	52.20	64.2	54.7
09:00PM-10:00PM	54.8	53.3	54.6	54.6	54.6	53.6	52.6	53.5	53.6	54.6	52.4	54.4	52.40	64.7	54.8

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	43.2	44.2	44.2	43.6	43.6	43.3	44.2	44.2	43.6	44.3	43.3	44.2	43.2	44.6	44.3
11:00PM-12:00AM	44.2	43.6	43.3	43.7	43.9	43.5	43.6	43.9	43.7	43.5	43.9	43.6	43.3	44.5	44.2
12:00AM-01:00AM	43.6	43.7	44.5	43.2	44.7	43.6	44.2	43.3	44.2	44.6	43.4	44.2	43.2	44.8	44.7
01:00AM-02:00AM	43.3	44.2	43.8	44.2	43.8	44.2	43.8	44.2	43.1	44.2	43.6	43.8	43.1	44.7	44.2
02:00AM-03:00AM	44.7	43.3	43.1	43.6	44.2	43.6	44.3	43.8	44.6	43.6	43.6	43.6	43.1	44.7	44.7
03:00AM-04:00AM	43.9	43.5	44.2	43.6	43.9	44.7	43.5	44.2	44.7	43.6	43.6	43.6	43.5	44.7	44.7
04:00AM-05:00AM	44.8	43.6	43.3	43.7	44.7	43.8	43.6	43.3	43.6	43.2	44.7	44.3	43.2	44.7	44.8
05:00AM-06:00AM	43.9	43.7	44.5	43.2	43.9	44.9	44.2	43.4	43.6	43.6	43.9	43.2	43.2	44.7	44.9



OVERSEAS TEST HOUSE & RESEARCH CENTRE PVT. LTD.

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Certificate No.: TC-5165

VILAGE: KHARKHODA JUNCTION

Monitoring Date: 19-20 /12/2020

DAY	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
06:00AM-07:00AM	53.4	54.8	54.2	53.2	54.2	53.4	54.2	53.7	54.6	53.8	54.8	54.2	53.20	64.9	54.8
07:00AM-08:00AM	52.7	54.2	53.2	54.8	52.7	54.6	54.7	54.8	53.7	54.7	54.2	53.6	52.70	64.8	54.8
08:00AM-09:00AM	53.6	52.6	53.7	54.6	53.4	54.2	54.2	52.4	53.7	53.2	54.7	53.8	52.40	64.5	54.7
09:00AM-10:00AM	54.3	54.5	53.7	54.1	53.6	55.2	53.4	54.7	54.2	54.3	54.7	53.8	53.40	65.0	55.2
10:00AM-11:00AM	54.7	54.2	53.2	54.6	52.6	54.3	54.2	53.2	54.1	54.3	53.4	52.7	52.60	64.6	54.7
11:00AM-12:00PM	53.7	54.9	53.9	54.3	54.7	53.7	53.7	54.2	53.7	54.2	54.2	53.2	53.20	64.9	54.9
12:00PM-01:00PM	53.4	54.8	53.2	53.7	52.7	54.4	53.8	54.8	53.7	54.7	54.3	53.5	52.70	64.8	54.8
01:00PM-02:00PM	54.6	53.4	54.6	53.7	54.6	53.6	54.7	53.6	57	53.5	54.2	53.8	53.8	65.2	57.0
02:00PM-03:00PM	53.7	54.2	53.9	54.9	53.7	54.7	52.7	53.4	54.2	53.5	54.3	54.2	52.70	64.8	54.9
03:00PM-04:00PM	53.7	54.2	53.7	54.8	53.6	52.7	53.6	52.6	54.6	53.6	54.8	54.7	52.60	64.7	54.8
04:00PM-05:00PM	53.6	54.7	53.7	54.6	53.7	54.5	53.7	54.8	53.7	54.6	53.9	54.2	53.60	65.0	54.8
05:00PM-06:00PM	53.6	54.7	54.2	53	52.3	53.2	54.3	53.2	54.7	53.7	54.7	53.8	52.30	64.6	54.7
06:00PM-07:00PM	54.3	53.6	54.3	54.6	53.7	53.2	54	53.5	54.6	53.6	52.9	54.5	52.90	64.7	54.6
07:00PM-08:00PM	53.7	55	53.7	54.1	54.3	53.5	54	53.3	54.4	53.7	54.9	53.7	53.30	64.8	55.0
08:00PM-09:00PM	54.8	53.9	54.6	53.7	54.2	53.6	54.7	55.6	57.2	54.3	53.9	52.7	52.70	65.4	57.2
09:00PM-10:00PM	54.9	53.7	54.6	54.2	53.8	54.9	53.8	54.7	53.9	54.7	53.6	54.6	53.60	65.1	54.9

NIGHT	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	MIN	LEQ	MAX
10:00PM-11:00PM	42.6	43.4	43	43.7	42.3	43.7	42.4	43.5	44.2	42.4	44.3	42.2	42.2	44.0	44.3
11:00PM-12:00AM	41.4	42.8	43.4	43.2	43.3	43.9	42.2	43.7	42.2	43.7	41.9	43.7	41.4	43.8	43.9
12:00AM-01:00AM	43.4	42.3	43.6	42.7	43.9	42.4	43.7	42.8	43.7	42.5	41.9	42.4	41.9	43.8	43.9
01:00AM-02:00AM	43.2	43.2	42.4	43.3	42.4	43.4	42.9	43.4	42.2	43.6	43.4	42.7	42.2	43.8	43.6
02:00AM-03:00AM	42.8	43.4	42.9	43.4	42.7	43.3	42.8	43.9	42.8	43.5	42.9	43.4	42.7	44.0	43.9
03:00AM-04:00AM	43.2	42.2	42.8	43.8	41.9	42.7	43.7	42.8	43.1	43.4	42.2	43.9	41.9	43.8	43.9
04:00AM-05:00AM	43.7	42.9	43.8	42.4	41.7	42.9	43.6	42.5	43.6	42.9	41.3	42.4	41.3	43.7	43.8
05:00AM-06:00AM	42.9	41.7	43.7	42.7	43.9	42.2	43.4	42.7	43.8	42.9	43	43.2	41.7	43.8	43.9

Where R -1 is Reading -1, R -2 is Reading -2, R - 3 is Reading -3, R -4 is Reading -4, R -5 is Reading -5, R-6 is Reading -6 , R – 7 is Reading -7, R -8 is Reading -8 , R- 9 is Reading – 9, R – 10 is Reading -10, R – 11 is Reading -11 and R-12 is Reading -12.

Detail of Tree to be cut due to proposed HORC alignment

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
GURUGRAM PALWAL	PALWAL	PRITHLA-42	<i>Acacia nilotica</i>	15	-2000	28.245914°	77.265093°	Agriculture Field
			<i>Phoenix dactylifera</i>	1	-1980	28.245902°	77.264316°	Agriculture Field
			<i>Phoenix dactylifera</i>	1	-1964	28.244866°	77.259776°	Canal
			<i>Phoenix dactylifera</i>	1	-1476	28.244866°	77.259776°	Canal
		CHHAPROLA-4	<i>Phoenix dactylifera</i>	1	-1307	28.244225°	77.257745°	Agriculture Field
			<i>Azardirecta indica</i>	1	-1300	28.244225°	77.257745°	Road side
			<i>Holoptela intigriafolia</i>	1	-1300	28.244225°	77.257745°	Road side
			<i>Azardirecta indica</i>	1	-1000	28.243412°	77.255449°	Agriculture Field
			<i>Azardirecta indica</i>	1	-1000	28.243412°	77.255449°	Agriculture Field
			<i>Prosopis juliflora</i>	1	-1000	28.243098°	77.254744°	Agriculture Field
			<i>Azardirecta indica</i>	1	-936	28.243282°	77.254423°	Road side
			<i>Azardirecta indica</i>	9	-850	28.243046°	77.254107°	Agriculture Field
			<i>Holoptela intigriafolia</i>	1	-840	28.242592°	77.254105°	Agriculture Field
			<i>Morus alba</i>	1	-600	28.242571°	77.253564°	Agriculture Field
			<i>Eucalyptus</i>	2	-580	28.242642°	77.252914°	Agriculture Field
			<i>Azardirecta indica</i>	1	-550	28.242350°	77.253061°	Agriculture Field
			<i>Azardirecta indica</i>	1	100	28.241486°	77.251454°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	350	28.245527°	77.248803°	Road side
			<i>Azardirecta indica</i>	1	700	28.239977°	77.245544°	Agriculture Field
			<i>Morus alba</i>	1	780	28.239841°	77.244833°	Agriculture Field
			<i>Azardirecta indica</i>	1	1200	28.238270°	77.240795°	Agriculture Field
			<i>Morus alba</i>	1	1550	28.237386°	77.237483°	Agriculture Field
			<i>Pongamia pinnata</i>	1	1550	28.237386°	77.237483°	Agriculture Field
			<i>Azardirecta indica</i>	5	1690	28.236784°	77.236328°	habitation
			<i>Ailanthus excelsa</i>	5	1700	28.236678°	77.235916°	habitation
			<i>Azardirecta indica</i>	5	1700	28.236678°	77.235916°	habitation
			<i>Azardirecta indica</i>	1	2150	28.235341°	77.231752°	Agriculture Field
		<i>Azardirecta indica</i>	1	2210	28.234919°	77.230963°	Agriculture Field	
		<i>Acacia nilotica</i>	1	2460	28.234256°	77.228733°	Agriculture Field	
		DEHLAKA-8	<i>Azardirecta indica</i>	1	3380	28.232320°	77.219807°	Agriculture Field
			<i>Azardirecta indica</i>	1	3400	28.232352°	77.219396°	Agriculture Field
		PAROLI-7	<i>Azardirecta indica</i>	4	4220	28.231864°	77.210863°	Agriculture Field
			<i>Acacia nilotica</i>	3	4370	28.231809°	77.209729°	Agriculture Field
<i>Azardirecta indica</i>	1		4540	28.231836°	77.208037°	Agriculture Field		
GURUGRAM PALWAL	SOHNA	RATIKANOABAD-210	<i>Polyalthia longifolia</i>	2	6530	28.230466°	77.187765°	Boundary Plantation
			<i>Pongamia pinnata</i>	1	6680	28.230268°	77.186230°	Agriculture Field
		KHUNTPURI-209	<i>Ailanthus excelsa</i>	1	6770	28.230086°	77.185277°	Agriculture Field
			<i>Ficus racemosa</i>	1	6770	28.230086°	77.185277°	Agriculture Field
			<i>Ficus racemosa</i>	2	7290	28.229873°	77.179996°	Agriculture Field

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Holoptela intigriafolia</i>	1	7420	28.229828°	77.178670°	Agriculture Field
			<i>Azardircta indica</i>	1	7480	28.229866°	77.178171°	Agriculture Field
			<i>Holoptela intigriafolia</i>	1	7490	28.229798°	77.177966°	Agriculture Field
			<i>Holoptela intigriafolia</i>	1	7510	28.229850°	77.177665°	Agriculture Field
			<i>Holoptela intigriafolia</i>	1	7520	28.229818°	77.177421°	Agriculture Field
			<i>Melia azedarach</i>	1	7560	28.229875°	77.177249°	Agriculture Field
			<i>Acacia nilotica</i>	1	7780	28.229407°	77.175045°	Agriculture Field
			<i>Prosopis cineraria</i>	1	8010	28.229161°	77.172738°	Agriculture Field
		SILANI-207	<i>Eucalyptus</i>	7	8500	28.228888°	77.167687°	Agriculture Field
			<i>Ficus religiosa</i>	1	8690	28.228700°	77.165850°	Agriculture Field
		KARANKI-206	<i>Phoenix dactylifera</i>	1	11110	28.226513°	77.141256°	Agriculture Field
			<i>Azardircta indica</i>	1	11200	28.226560°	77.140378°	Agriculture Field
			<i>Holoptela intigriafolia</i>	1	11240	28.226492°	77.140025°	Agriculture Field
			<i>Phoenix dactylifera</i>	1	11260	28.226467°	77.139799°	Agriculture Field
			<i>Zizyphus</i>	1	11270	28.226461°	77.139637°	Agriculture Field
			<i>Phoenix dactylifera</i>	1	11410	28.226250°	77.138196°	Agriculture Field
			<i>Ficus religiosa</i>	1	11410	28.226250°	77.138196°	Agriculture Field
			<i>Acacia nilotica</i>	1	11530	28.225892°	77.137129°	Road side
			<i>Acacia nilotica</i>	1	11530	28.225892°	77.137129°	Road side
			<i>Azardircta indica</i>	1	11530	28.225892°	77.137129°	Road side
			<i>Prosopis juliflora</i>	6	11530	28.225892°	77.137129°	Road side
			<i>Prosopis juliflora</i>	2	11530	28.225892°	77.137129°	Road side
			<i>Azardircta indica</i>	2	11570	28.225993°	77.136692°	Boundary Plantation
			<i>Eucalyptus</i>	1	11570	28.225993°	77.136692°	Boundary Plantation
			<i>Leucaena leucocephala</i>	1	11570	28.225993°	77.136692°	Boundary Plantation
			<i>Prosopis juliflora</i>	4	11570	28.225993°	77.136692°	Boundary Plantation
			<i>Ailanthus excelsa</i>	3	11590	28.225930°	77.136429°	Boundary Plantation
			<i>Azardircta indica</i>	3	11590	28.225930°	77.136429°	Boundary Plantation
		<i>Polyalthia longifolia</i>	1	11590	28.225930°	77.136429°	Boundary Plantation	
		<i>Syzigium SP</i>	1	11590	28.225930°	77.136429°	Boundary Plantation	
NUH	NUH	BHIRAWATI	<i>Melia azedarach</i>	1	11810	28.225491°	77.134219°	Agriculture Field
			<i>Acacia sp</i>	1	11920	28.225544°	77.132933°	Agriculture Field
			<i>Azardircta indica</i>	1	12040	28.225418°	77.131925°	Agriculture Field
			<i>Phoenix dactylifera</i>	6	12060	28.225366°	77.131655°	Agriculture Field
			<i>Acacia SP</i>	1	12040	28.225232°	77.130933°	Agriculture Field
			<i>Acacia tortilis</i>	1	12040	28.225232°	77.130933°	Agriculture Field
			<i>Phoenix dactylifera</i>	2	12040	28.225232°	77.130933°	Agriculture Field
GURUGRAM	SOHNA	SANCHOLI-205	<i>Ailanthus excelsa</i>	1	12160	28.225211°	77.130729°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	12230	28.224896°	77.130074°	Agriculture Field
			<i>Azardircta indica</i>	3	12300	28.224817°	77.129281°	Govt. Land
			<i>Dalbergia sissoo</i>	5	12300	28.224817°	77.129281°	Govt. Land

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Prosopis juliflora</i>	1	12300	28.224817°	77.129281°	Govt. Land
NUH	NUH	ATTA-179	<i>Acacia tortilis</i>	1	15000	28.211586°	77.106544°	Agriculture Field
			<i>Acacia tortilis</i>	1	15550	28.208827°	77.102034°	Agriculture Field
		INDRI-197	<i>Acacia tortilis</i>	2	15880	28.207056°	77.099339°	Agriculture Field
			<i>Acacia nilotica</i>	3	16720	28.201188°	77.093507°	Road side
			<i>Prosopis juliflora</i>	2	16720	28.201188°	77.093507°	Road side
		KHANPUR-177	<i>Prosopis juliflora</i>	2	17770	28.192751°	77.089012°	Agriculture Field
			<i>Prosopis juliflora</i>	3	17900	28.191624°	77.088528°	Agriculture Field
			<i>Prosopis juliflora</i>	2	18000	28.190805°	77.088274°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	18190	28.189290°	77.087583°	Agriculture Field
		KHERLI KANKAR-169	<i>Prosopis juliflora</i>	16	21000-21700	28.180776°	77.061496°	habitation
		RUPAHERI	<i>Azardirecta indica</i>	2	23080	28.189377°	77.048140°	Road side
			<i>Morus alba</i>	1	23085	28.189473°	77.048111°	Road side
			<i>Morus alba</i>	2	23200	28.191360°	77.047534°	Agriculture Field
		ROJKA MEO-173	<i>Acacia nilotica</i>	1	24140	28.199850°	77.047707°	Road side
			<i>Azardirecta indica</i>	4	24140	28.199850°	77.047707°	Road side
			<i>Ficus religiosa</i>	1	24140	28.199850°	77.047707°	Road side
			<i>Holoptela intigriafolia</i>	3	24140	28.199850°	77.047707°	Road side
			<i>Morus alba</i>	1	24140	28.199850°	77.047707°	Road side
	<i>Syzigium SP</i>		1	24140	28.199850°	77.047707°	Road side	
	<i>Zizyphus</i>		1	24140	28.199850°	77.047707°	Road side	
	TAURU	SEHSAULA-83	<i>Azardirecta indica</i>	1	27750	28.218257°	77.021180°	Agriculture Field
			<i>Zizyphus</i>	1	27760	28.218378°	77.021038°	Agriculture Field
			<i>Azardirecta indica</i>	1	27760	28.218750°	77.021019°	Agriculture Field
		MAINDLA-82	<i>Zizyphus</i>	1	28000	28.217822°	77.018739°	Agriculture Field
			<i>Prosopis juliflora</i>	1	28100	28.217740°	77.017638°	Agriculture Field
			<i>Prosopis juliflora</i>	1	28190	28.217531°	77.016844°	Agriculture Field
			<i>Acacia nilotica</i>	2	28370	28.218913°	77.015088°	Road side
			<i>Acacia tortilis</i>	9	28370	28.218913°	77.015088°	Road side
			<i>Azardirecta indica</i>	3	28370	28.218306°	77.014931°	Road side
			<i>Dalbergia sissoo</i>	1	28370	28.218306°	77.014931°	Road side
<i>Prosopis juliflora</i>			6	28370	28.217909°	77.014776°	Road side	
<i>Prosopis juliflora</i>			10	28370	28.217909°	77.014776°	Road side	
<i>Prosopis juliflora</i>	2		28520	28.217913°	77.013270°	Agriculture Field		
<i>Phoenix dactylifera</i>	1	28550	28.218412°	77.012891°	Agriculture Field			
DHULAWAT-81	<i>Dalbergia sissoo</i>	1	28610	28.218388°	77.012403°	Agriculture Field		
	<i>Dalbergia sissoo</i>	2	28810	28.218378°	77.010295°	Agriculture Field		
	<i>Morus alba</i>	3	28820	28.218032°	77.010088°	Agriculture Field		
	<i>Dalbergia sissoo</i>	4	28820	28.218972°	77.010165°	Agriculture Field		
	<i>Dalbergia sissoo</i>	7	28980	28.218714°	77.008733°	Agriculture Field		
	<i>Acacia nilotica</i>	1	29000	28.218996°	77.007467°	Agriculture Field		
	<i>Albizia lebbek</i>	1	29000	28.218996°	77.007467°	Agriculture Field		

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Dalbergia sissoo</i>	3	29000	28.218996°	77.007467°	Agriculture Field
			<i>Azardirecta indica</i>	2	29010	28.219596°	77.005422°	Agriculture Field
			<i>Dalbergia sissoo</i>	3	29010	28.219596°	77.005422°	Agriculture Field
			<i>Acacia tortilis</i>	1	29240	28.218999°	77.005835°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	29240	28.218999°	77.005835°	Agriculture Field
			<i>Prosopis juliflora</i>	1	29240	28.218999°	77.005835°	Agriculture Field
			<i>Acacia nilotica</i>	1	29330	28.219029°	77.004669°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	29330	28.219029°	77.004669°	Agriculture Field
			<i>Prosopis juliflora</i>	1	29330	28.219029°	77.004669°	Agriculture Field
			<i>Acacia tortilis</i>	1	29390	28.219710°	77.004690°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	29390	28.219710°	77.004690°	Agriculture Field
			<i>Morus alba</i>	2	29390	28.219710°	77.004690°	Agriculture Field
			<i>Azardirecta indica</i>	1	29470	28.219762°	77.003779°	Agriculture Field
			<i>Dalbergia sissoo</i>	7	29470	28.219762°	77.003779°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	29590	28.220291°	77.002849°	Agriculture Field
			<i>Morus alba</i>	1	29590	28.219779°	77.002543°	Agriculture Field
			<i>Albizzia lebbek</i>	1	29610	28.220047°	77.002289°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	29610	28.220047°	77.002289°	Agriculture Field
			<i>Acacia nilotica</i>	3	29690	28.220192°	77.001628°	Agriculture Field
			<i>Morus alba</i>	2	29720	28.220628°	77.001292°	Agriculture Field
			<i>Zizyphus</i>	1	29760	28.220229°	77.000942°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	29820	28.220556°	77.000077°	Agriculture Field
			<i>Azardirecta indica</i>	2	29820	28.220556°	77.000077°	Agriculture Field
			<i>Dalbergia sissoo</i>	3	29820	28.220556°	77.000077°	Agriculture Field
			<i>Phoenix dactylifera</i>	1	29820	28.220556°	77.000077°	Agriculture Field
			<i>Zizyphus</i>	1	29820	28.220556°	77.000077°	Agriculture Field
			<i>Azardirecta indica</i>	3	30010	28.221216°	76.998572°	Agriculture Field
			<i>Dalbergia sissoo</i>	5	30030	28.221622°	76.998337°	Agriculture Field
			<i>Azardirecta indica</i>	2	30090	28.221541°	76.997888°	Agriculture Field
			<i>Acacia nilotica</i>	1	30110	28.221737°	76.997732°	Agriculture Field
			<i>Morus alba</i>	1	30190	28.222092°	76.997121°	Agriculture Field
		BIDHUWAS-80	<i>Albizzia lebbek</i>	16	30360	28.222656°	76.995356°	Agriculture Field
			<i>Morus alba</i>	2	30510	28.223125°	76.993815°	Agriculture Field
			<i>Acacia nilotica</i>	50	30610	28.223494°	76.992986°	Agriculture Field
		PADHANI-78	<i>Acacia tortilis</i>	10	31110	28.224932°	76.988028°	Agriculture Field
			<i>Azardirecta indica</i>	1	31770	28.228491°	76.982945°	Agriculture Field
			<i>Azardirecta indica</i>	1	32570	28.234144°	76.977597°	Agriculture Field
		GOGJAKA-75	<i>Acacia nilotica</i>	2	33200	28.237779°	76.972658°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	33390	28.238982°	76.971386°	Agriculture Field
		GOELA-19	<i>Melia azedarach</i>	9	33390	28.238982°	76.971386°	Agriculture Field
			<i>Morus alba</i>	5	33390	28.238982°	76.971386°	Agriculture Field
			<i>Albizzia lebbek</i>	4	33490	28.239589°	76.970821°	Agriculture Field

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Dalbergia sissoo</i>	1	33490	28.239589°	76.970821°	Agriculture Field
			<i>Melia azedarach</i>	5	33490	28.239589°	76.970821°	Agriculture Field
			<i>Morus alba</i>	2	33490	28.239589°	76.970821°	Agriculture Field
			<i>Dalbergia sissoo</i>	3	33700	28.241043°	76.969229°	Road side
			<i>Ficus religiosa</i>	1	33700	28.241043°	76.969229°	Road side
			<i>Phoenix dactylifera</i>	2	33700	28.241043°	76.969229°	Road side
			<i>Leucaena leucocephala</i>	1	33680	28.240875°	76.969499°	Road side
			<i>Melia azedarach</i>	2	33680	28.240875°	76.969499°	Road side
			<i>Morus alba</i>	1	33680	28.240875°	76.969499°	Road side
			<i>Morus alba</i>	1	33680	28.240875°	76.969499°	Road side
			<i>Dalbergia sissoo</i>	3	33700	28.241043°	76.969229°	Road side
			<i>Ficus religiosa</i>	1	33700	28.241043°	76.969229°	Road side
			<i>Phoenix dactylifera</i>	2	33700	28.241043°	76.969229°	Road side
			<i>Ailanthus excelsa</i>	12	33720	28.241056°	76.968849°	Road side
			<i>Albizia lebbek</i>	8	33720	28.241056°	76.968849°	Road side
			<i>Polyalthia longifolia</i>	60	33750	28.241363°	76.968795°	Fromhouse
			<i>Dalbergia sissoo</i>	7	33830	28.241843°	76.968093°	Agriculture Field
			<i>Morus alba</i>	3	33850	28.242126°	76.968126°	Agriculture Field
			<i>Phyllanthus emblica</i>	2	33870	28.242347°	76.968079°	Agriculture Field
			<i>Tectona grandis</i>	3	33870	28.242347°	76.968079°	Agriculture Field
			<i>Zizyphus</i>	1	33900	28.242362°	76.967833°	Agriculture Field
			<i>Psidium gujaba</i>	85	33950	28.242608°	76.967561°	Orchard
			<i>Tectona grandis</i>	10	33950	28.242608°	76.967561°	Orchard
			<i>Azardirecta indica</i>	1	34000	28.242869°	76.966937°	Agriculture Field
			<i>Melia azedarach</i>	4	34000	28.242869°	76.966937°	Agriculture Field
			<i>Morus alba</i>	2	34050	28.243329°	76.966842°	Agriculture Field
			<i>Azardirecta indica</i>	3	34100	28.243509°	76.966186°	Agriculture Field
			<i>Citrus lemon</i>	1	34150	28.244019°	76.966086°	Agriculture Field
			<i>Azardirecta indica</i>	1	34440	28.245824°	76.963994°	Agriculture Field
			<i>Ficus religiosa</i>	1	34770	28.247670°	76.961439°	Agriculture Field
			<i>Morus alba</i>	5	34840	28.248206°	76.960735°	Agriculture Field
		DEENGARHERI-21	<i>Dalbergia sissoo</i>	1	34900	28.248442°	76.960351°	Road side
			<i>Acacia tortilis</i>	2	34940	28.248536°	76.960065°	Road side
			<i>Ailanthus excelsa</i>	3	34940	28.248536°	76.960065°	Road side
			<i>Holoptela intigriafolia</i>	2	34940	28.248536°	76.960065°	Road side
			<i>Acacia tortilis</i>	1	35010	28.249229°	76.959397°	Agriculture Field
			<i>Ailanthus excelsa</i>	3	35400	28.250717°	76.955925°	Agriculture Field
			<i>Melia azedarach</i>	2	35500	28.251050°	76.954927°	Agriculture Field
			<i>Syzigium SP</i>	1	35700	28.251931°	76.953263°	Agriculture Field
			<i>Azardirecta indica</i>	1	35790	28.252669°	76.952595°	Agriculture Field
			<i>Azardirecta indica</i>	1	35810	28.252485°	76.952217°	Agriculture Field
			<i>Melia azedarach</i>	3	36000	28.253476°	76.950672°	Agriculture Field

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						Latitude	Longitude	
			<i>Morus alba</i>	1	36000	28.253476°	76.950672°	Agriculture Field
			<i>Ficus religiosa</i>	1	36190	28.254480°	76.949087°	Agriculture Field
			<i>Melia azedarach</i>	1	36240	28.254585°	76.948734°	Agriculture Field
			<i>Morus alba</i>	1	36260	28.254560°	76.948485°	Agriculture Field
			<i>Dalbergia sissoo</i>	4	36050	28.253867°	76.950424°	Agriculture Field
			<i>Morus alba</i>	2	36110	28.254111°	76.949904°	Agriculture Field
			<i>Ailanthus excelsa</i>	2	36110	28.254111°	76.949904°	Agriculture Field
		SABRAS-27	<i>Azardircta indica</i>	4	36470	28.255666°	76.946570°	Agriculture Field
			<i>Azardircta indica</i>	1	37000	28.258266°	76.941755°	Agriculture Field
			<i>Ailanthus excelsa</i>	3	37090	28.258642°	76.941169°	Agriculture Field
			<i>Azardircta indica</i>	2	37660	28.261575°	76.936568°	Agriculture Field
			<i>Dalbergia sissoo</i>	3	37660	28.261575°	76.936568°	Agriculture Field
			<i>Melia azedarach</i>	2	37660	28.261575°	76.936568°	Agriculture Field
			<i>Morus alba</i>	5	37660	28.261575°	76.936568°	Agriculture Field
			<i>Dalbergia sissoo</i>	10	38000	28.263551°	76.933838°	Agriculture Field
			<i>Dalbergia sissoo</i>	105	38040	28.263741°	76.933420°	Orchard
			<i>Dalbergia sissoo</i>	3	38110	28.264105°	76.932916°	Agriculture Field
		<i>Morus alba</i>	1	38110	28.264105°	76.932916°	Agriculture Field	
		KALWARI-6	<i>Azardircta indica</i>	1	38880	28.268454°	76.926915°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	38950	28.268814°	76.926185°	Agriculture Field
			<i>Acacia nilotica</i>	2	39190	28.270125°	76.924394°	Road side
			<i>Acacia tortilis</i>	1	39190	28.270125°	76.924394°	Road side
			<i>Alstonia secholaris</i>	7	39330	28.271082°	76.923306°	habitation
			<i>Dalbergia sissoo</i>	2	39330	28.271082°	76.923306°	habitation
			<i>Melia azedarach</i>	8	39360	28.271044°	76.922884°	habitation
			<i>Morus alba</i>	10	39370	28.271221°	76.922945°	habitation
			<i>Syzigium SP</i>	3	39380	28.271137°	76.922762°	habitation
			<i>Acacia nilotica</i>	1	39710	28.273013°	76.920057°	Agriculture Field
			<i>Acacia nilotica</i>	1	40350	28.276995°	76.915420°	Agriculture Field
			<i>Azardircta indica</i>	1	40450	28.277670°	76.914852°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	40450	28.277670°	76.914852°	Agriculture Field
		<i>Dalbergia sissoo</i>	1	41000	28.282035°	76.911738°	Agriculture Field	
		GURUGRAM	MANESAR	UDEPURI-144	<i>Melia azedarach</i>	1	41400	28.285177°
<i>Aegle marmelos</i>	1				41530	28.286194°	76.909188°	Fromhouse Boundary
<i>Alstonia secholaris</i>	1				41580	28.286410°	76.908651°	Fromhouse Boundary
<i>Ficus religiosa</i>	1				41630	28.286752°	76.908453°	Fromhouse Boundary
<i>Populus</i>	3				41630	28.286752°	76.908453°	Fromhouse Boundary
<i>Syzigium SP</i>	1				41660	28.287057°	76.908237°	Fromhouse Boundary
CHANDLA DUNGARWAS-148	<i>Ficus religiosa</i>			5	43330	28.300676°	76.900766°	Agriculture Field
	<i>Dalbergia sissoo</i>			1	43330	28.300676°	76.900766°	habitation
	<i>Melia azedarach</i>			3	43500	28.301697°	76.899433°	habitation
	<i>Azardircta indica</i>			1	43500	28.301697°	76.899433°	Road side

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						Latitude	Longitude	
			<i>Dalbergia sissoo</i>	4	43500	28.301697°	76.899433°	Road side
			<i>Azardircta indica</i>	2	43770	28.303768°	76.898076°	Fromhouse
			<i>Dalbergia sissoo</i>	1	43810	28.304110°	76.897948°	Fromhouse
			<i>Ficus religiosa</i>	1	43860	28.304583°	76.897776°	Fromhouse
			<i>Melia azedarach</i>	4	43940	28.305181°	76.897578°	habitation
			<i>Dalbergia sissoo</i>	1	43940	28.305181°	76.897578°	habitation
			<i>Dalbergia sissoo</i>	1	44100	28.306916°	76.897072°	Agriculture Field
			<i>Melia azedarach</i>	6	44100	28.306916°	76.897072°	Agriculture Field
			<i>Morus alba</i>	1	44100	28.306916°	76.897072°	Agriculture Field
			<i>Acacia tortilis</i>	15	44240	28.308008°	76.896974°	Govt. Land
		FAZALWAS-149	<i>Acacia tortilis</i>	3	44650	28.311578°	76.896426°	Agriculture Field
			<i>Morus alba</i>	3	44700	28.312005°	76.896314°	Agriculture Field
			<i>Populus</i>	7	44760	28.312447°	76.896229°	Agriculture Field
			<i>Acacia tortilis</i>	3	44880	28.313306°	76.895702°	Agriculture Field
			<i>Melia azedarach</i>	1	44880	28.313306°	76.895702°	Agriculture Field
			<i>Melia azedarach</i>	2	44980	28.314388°	76.895546°	Agriculture Field
			<i>Morus alba</i>	1	44980	28.314388°	76.895546°	Agriculture Field
			<i>Albizia lebbek</i>	1	45050	28.314951°	76.895157°	Agriculture Field
			<i>Azardircta indica</i>	1	45050	28.314951°	76.895157°	Agriculture Field
			<i>Melia azedarach</i>	3	45050	28.314951°	76.895157°	Agriculture Field
			<i>Ficus religiosa</i>	4	45170	28.316026°	76.895509°	habitation
			<i>Acacia nilotica</i>	1	44400 to 44550	28.310038°	76.896892°	Agriculture Field
			<i>Albizia lebbek</i>	1	44400 to 44550	28.310038°	76.896892°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	44400 to 44550	28.310038°	76.896892°	Agriculture Field
		<i>Ficus racemosa</i>	1	44400 to 44550	28.310038°	76.896892°	Agriculture Field	
		<i>Gravilia robusta</i>	60	44400 to 44550	28.310038°	76.896892°	Agriculture Field	
		KUKROLA-151	<i>Melia azedarach</i>	4	45490	28.318912°	76.895420°	Road side
			<i>Acacia nilotica</i>	50	45500	28.318905°	76.895277°	Road side
			<i>Holoptela intigriafolia</i>	2	45790	28.321355°	76.894087°	Road side
			<i>Azardircta indica</i>	1	45970	28.322820°	76.892957°	Agriculture Field
			<i>Melia azedarach</i>	3	46100	28.323985°	76.892725°	Road side
			<i>Morus alba</i>	1	46140	28.324297°	76.892539°	Road side
			<i>Azardircta indica</i>	5	46190	28.324661°	76.892113°	Agriculture Field
			<i>Melia azedarach</i>	1	46190	28.324661°	76.892113°	Agriculture Field
FAKHARPUR-133	<i>Azardircta indica</i>	1	46270	28.325288°	76.892016°	Agriculture Field		
	<i>Azardircta indica</i>	1	46300	28.325595°	76.891634°	Agriculture Field		
	<i>Acacia nilotica</i>	1	46450	28.326614°	76.890787°	Agriculture Field		
	<i>Azardircta indica</i>	1	46450	28.326614°	76.890787°	Agriculture Field		
	<i>Ficus religiosa</i>	1	46450	28.326614°	76.890787°	Agriculture Field		
	<i>Azardircta indica</i>	1	46630	28.328111°	76.890044°	Gaushala		
KASAN	<i>Ailanthus excelsa</i>	1	46790	28.328442°	76.889407°	Agriculture Field		
	<i>Azardircta indica</i>	2	46790	28.328442°	76.889407°	Agriculture Field		

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						Latitude	Longitude		
			<i>Acacia tortilis</i>	1	46790	28.328442°	76.889407°	Road side	
			<i>Azardircta indica</i>	1	46930	28.330269°	76.887957°	Road side	
		MOKALWAS-132	<i>Acacia tortilis</i>	1	47130	28.331621°	76.886826°	Agriculture Field	
			<i>Ailanthus excelsa</i>	1	47130	28.331621°	76.886826°	Agriculture Field	
			<i>Melia azedarach</i>	3	47130	28.331621°	76.886826°	Agriculture Field	
			<i>Morus alba</i>	1	47130	28.331621°	76.886826°	Agriculture Field	
			<i>Ailanthus excelsa</i>	1	47190	28.332254°	76.886622°	Road side	
			<i>Melia azedarach</i>	6	47190	28.332254°	76.886622°	Road side	
			<i>Morus alba</i>	1	47190	28.332254°	76.886622°	Road side	
			<i>Melia azedarach</i>	6	47270	28.332782°	76.886431°	Agriculture Field	
			<i>Tectona grandis</i>	2	47280	28.332806°	76.886081°	Agriculture Field	
			<i>Ailanthus excelsa</i>	1	47320	28.333312°	76.885985°	Agriculture Field	
			<i>Melia azedarach</i>	1	47320	28.333312°	76.885985°	Agriculture Field	
			<i>Ailanthus excelsa</i>	4	47320	28.333312°	76.885985°	Road side	
			<i>Melia azedarach</i>	10	47320	28.333312°	76.885985°	Road side	
			<i>Dalbergia sissoo</i>	2	47480	28.334594°	76.885560°	Agriculture Field	
			<i>Holoptela intigriafolia</i>	2	47480	28.334594°	76.885560°	Agriculture Field	
			<i>Melia azedarach</i>	30	47480	28.334594°	76.885560°	Agriculture Field	
			<i>Melia azedarach</i>	1	47530	28.335027°	76.885029°	Agriculture Field	
			<i>Acacia tortilis</i>	1	47700	28.336426°	76.884564°	Agriculture Field	
			<i>Acacia tortilis</i>	5	47820	28.337555°	76.884046°	Road side	
			<i>Ailanthus excelsa</i>	1	47820	28.337555°	76.884046°	Road side	
		<i>Azardircta indica</i>	1	47820	28.337555°	76.884046°	Road side		
		<i>Morus alba</i>	1	47820	28.337555°	76.884046°	Road side		
		<i>Acacia tortilis</i>	2	47900 to 48100	28.339089°	76.883552°	KMP Boundry and Habitaton		
		<i>Ailanthus excelsa</i>	1	47900 to 48100	28.339089°	76.883552°	KMP Boundry and Habitaton		
		<i>Dalbergia sissoo</i>	2	47900 to 48100	28.339089°	76.883552°	KMP Boundry and Habitaton		
		<i>Melia azedarach</i>	44	47900 to 48100	28.339089°	76.883552°	KMP Boundry and Habitaton		
		<i>Morus alba</i>	4	47900 to 48100	28.339089°	76.883552°	KMP Boundry and Habitaton		
		<i>Prosopis juliflora</i>	1	47900 to 48100	28.339089°	76.883552°	KMP Boundry and Habitaton		
		KASAN	<i>Azardircta indica</i>	4	48100	28.340168°	76.883451°	habitation	
			<i>Azardircta indica</i>	3	48300	28.341676°	76.883227°	habitation	
			<i>Dalbergia sissoo</i>	1	48870	28.346602°	76.882400°	KMP Boundry and Habitaton	
			<i>Melia azedarach</i>	3	48950	28.347408°	76.882295°	Agriculture Field	
			<i>Acacia tortilis</i>	1	49330	28.350972°	76.881663°	Agriculture Field	
			<i>Azardircta indica</i>	2	49330	28.350972°	76.881663°	Agriculture Field	
		F. NAGAR	JHUND SARAI ABAD-124	<i>Dalbergia sissoo</i>	2	53670	28.388541°	76.869440°	Agriculture Field
				<i>Azardircta indica</i>	1	53670	28.388541°	76.869440°	Agriculture Field
				<i>Prosopis juliflora</i>	1800	49330 to 53200	28.371986°	76.874591°	
				<i>Alstonia secholaris</i>	30	53750 to 54000	28.390455°	76.869274°	Fromhouse
				<i>Ficus virens</i>	40	53750 to 54000	28.390455°	76.869274°	Fromhouse
<i>Gravilia robusta</i>	2			53750 to 54000	28.390455°	76.869274°	Fromhouse		

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Jarcrandra mimosifolia</i>	10	53750 to 54000	28.390455°	76.869274°	Fromhouse
			<i>Mangifera inidca</i>	8	53750 to 54000	28.390455°	76.869274°	Fromhouse
			<i>Phyllanthus emblica</i>	10	53750 to 54000	28.390455°	76.869274°	Fromhouse
			<i>Mangifera inidca</i>	1	54070	28.392099°	76.869174°	Agriculture Field
			<i>Mangifera inidca</i>	50	53200 to 53600	28.385583°	76.870382°	
		PATLI HAJIPUR-34	<i>Eucalyptus</i>	1	55900	28.408672°	76.868991°	Agriculture Field
			<i>Acacia tortilis</i>	20	55550 to 55800	28.406605°	76.869101°	Barren Land
			<i>Acacia nilotica</i>	3	55550 to 55800	28.406605°	76.869101°	Barren Land
			<i>Acacia tortilis</i>	12	55550 to 55800	28.406605°	76.869101°	Barren Land
			<i>Ailanthus excelsa</i>	8	56000	28.409554°	76.869235°	Road side
			<i>Dalbergia sissoo</i>	3	56000	28.409554°	76.869235°	Boundary Plantation
			<i>Syzigium SP</i>	1	56000	28.409554°	76.869235°	Boundary Plantation
			<i>Dalbergia sissoo</i>	1	56180	28.411078°	76.868831°	Agriculture Field
			<i>Azardircta indica</i>	1	56360	28.412685°	76.868215°	Agriculture Field
			<i>Azardircta indica</i>	40	56830	28.416804°	76.867552°	Agriculture Field
			<i>Acacia tortilis</i>	2	57840	28.425744°	76.865491°	Barren Land
			<i>Morus alba</i>	1	57900	28.426365°	76.865303°	Barren Land
			<i>Phoenix dactylifera</i>	1	58300	28.429900°	76.864552°	Agriculture Field
			<i>Acacia nilotica</i>	1	58300	28.429900°	76.864552°	Agriculture Field
			<i>Acacia nilotica</i>	1	58300	28.429900°	76.864552°	Agriculture Field
		<i>Dalbergia sissoo</i>	1	58650	28.433013°	76.863838°	Agriculture Field	
		KHENTAWAS-118	<i>Prosopis juliflora</i>	1	58850	28.434649°	76.863484°	Agriculture Field
			<i>Acacia nilotica</i>	2	59100	28.437062°	76.862492°	Road side
			<i>Acacia tortilis</i>	2	59100	28.437062°	76.862492°	Road side
			<i>Acacia tortilis</i>	2	59180	28.437532°	76.862493°	Agriculture Field
			<i>Ficus religiosa</i>	1	59180	28.437532°	76.862493°	Agriculture Field
			<i>Ailanthus excelsa</i>	1	59180	28.437532°	76.862493°	Agriculture Field
			<i>Acacia nilotica</i>	1	59180	28.437532°	76.862493°	Agriculture Field
			<i>Ailanthus excelsa</i>	8	59900 to 60200	28.445810°	76.860544°	Orchard
			<i>Albizia lebbek</i>	4	59900 to 60200	28.445810°	76.860544°	Orchard
			<i>Alstonia secholaris</i>	8	59900 to 60200	28.445810°	76.860544°	Orchard
			<i>Azardircta indica</i>	10	59900 to 60200	28.445810°	76.860544°	Orchard
			<i>Melia azedarach</i>	12	59900 to 60200	28.445810°	76.860544°	Orchard
<i>Pongamia pinnata</i>	10		59900 to 60200	28.445810°	76.860544°	Orchard		
SULTANPUR-39	<i>Dalbergia sissoo</i>	1	61590	28.458743°	76.857431°	Agriculture Field		
	<i>Dalbergia sissoo</i>	1	61590	28.458743°	76.857431°	Agriculture Field		
	<i>Acacia nilotica</i>	1	61590	28.458743°	76.857431°	Agriculture Field		
	<i>Dalbergia sissoo</i>	1	61590	28.458743°	76.857431°	Agriculture Field		
	<i>Dalbergia sissoo</i>	1	61700	28.459903°	76.857312°	Agriculture Field		
	<i>Acacia nilotica</i>	1	61700	28.459903°	76.857312°	Agriculture Field		
	<i>Dalbergia sissoo</i>	1	61700	28.459903°	76.857312°	Agriculture Field		
	<i>Dalbergia sissoo</i>	1	61700	28.459903°	76.857312°	Agriculture Field		

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use		
						Latitude	Longitude			
			<i>Dalbergia sissoo</i>	1	61700	28.459903°	76.857312°	Agriculture Field		
			<i>Dalbergia sissoo</i>	2	61900	28.461605°	76.857192°	Agriculture Field		
			<i>Acacia nilotica</i>	1	61900	28.461605°	76.857192°	Agriculture Field		
			<i>Dalbergia sissoo</i>	1	61900	28.461605°	76.857192°	Agriculture Field		
			<i>Dalbergia sissoo</i>	1	62220	28.464669°	76.857118°	Agriculture Field		
			<i>Dalbergia sissoo</i>	1	62400	28.466238°	76.856858°	Agriculture Field		
			<i>Dalbergia sissoo</i>	1	62600	76.856769°	76.856798°	Agriculture Field		
			<i>Azardircta indica</i>	1	62900	28.470662°	76.856769°	Agriculture Field		
			<i>Azardircta indica</i>	1	62960	28.471187°	76.856484°	Agriculture Field		
			<i>Dalbergia sissoo</i>	1	63200	28.473479°	76.856224°	Agriculture Field		
			<i>Azardircta indica</i>	1	63420	28.475221°	76.855551°	Agriculture Field		
			<i>Dalbergia sissoo</i>	1	63850	28.478876°	76.854133°	Agriculture Field		
			<i>Acacia nilotica</i>	1	64100	28.481089°	76.852925°	Agriculture Field		
			<i>Dalbergia sissoo</i>	1	64290	28.482529°	76.852249°	Agriculture Field		
			JHANJIROLA-38	<i>Prosopis cineraria</i>	1	64600	28.485159°	76.850882°	Agriculture Field	
		<i>Prosopis cineraria</i>		1	64800	28.486785°	76.849910°	Agriculture Field		
		<i>Prosopis cineraria</i>		1	65100	28.489056°	76.848197°	Agriculture Field		
		<i>Prosopis cineraria</i>		1	65470	28.491039°	28.491039°	Agriculture Field		
		MUBARIKPUR-37	<i>Prosopis cineraria</i>	1	65560	28.492432°	76.845673°	Agriculture Field		
			<i>Prosopis juliflora</i>	1	65610	28.492758°	76.845282°	Agriculture Field		
			<i>Prosopis cineraria</i>	1	66000	28.496045°	76.843844°	Agriculture Field		
			<i>Acacia nilotica</i>	1	66350	28.498095°	76.842896°	Agriculture Field		
		JHAJJAR	BADLI	MUNDAKHERA-78	<i>Dalbergia sissoo</i>	1	67100	28.505175°	76.839658°	Agriculture Field
					<i>Dalbergia sissoo</i>	1	67650	28.509795°	76.837823°	Agriculture Field
					<i>Dalbergia sissoo</i>	1	67660	28.509880°	76.837806°	Agriculture Field
					<i>Dalbergia sissoo</i>	2	67870	28.511671°	76.836965°	Agriculture Field
					<i>Dalbergia sissoo</i>	1	67980	28.512659°	76.836640°	Agriculture Field
					<i>Dalbergia sissoo</i>	1	68080	28.513483°	76.836303°	Agriculture Field
					<i>Prosopis juliflora</i>	1	68150	28.514104°	76.836110°	Agriculture Field
					<i>Prosopis juliflora</i>	1	68290	28.515286°	76.835607°	Agriculture Field
<i>Prosopis juliflora</i>	1				68880	28.520364°	76.833531°	Agriculture Field		
<i>Dalbergia sissoo</i>	1				69080	28.521960°	76.833042°	Agriculture Field		
<i>Prosopis juliflora</i>	1				69220	28.523272°	76.832347°	Agriculture Field		
ISMILPUR-79	<i>Dalbergia sissoo</i>			1	69570	28.526134°	76.831285°	Agriculture Field		
DEWARKHANA-75	<i>Prosopis juliflora</i>			1	69890	28.528978°	76.830383°	Agriculture Field		
LAGARPUR-74	<i>Ficus religiosa</i>			1	70150	28.531258°	76.829560°	Agriculture Field		
	<i>Ficus religiosa</i>			1	70950	28.538281°	76.827885°	Agriculture Field		
	<i>Azardircta indica</i>			1	71400	28.542411°	76.827005°	Agriculture Field		
	<i>Dalbergia sissoo</i>			1	71400	28.542411°	76.827005°	Agriculture Field		
BADLI-72	<i>Azardircta indica</i>			1	72100	28.548411°	76.825070°	Agriculture Field		
	<i>Dalbergia sissoo</i>			1	72320	28.550262°	76.824158°	Agriculture Field		
	<i>Prosopis juliflora</i>			1	72340	28.550619°	76.824348°	Agriculture Field		

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						Latitude	Longitude		
			<i>Azardirecta indica</i>	6	72510	28.552113°	76.823899°	Agriculture Field	
			DARYAPUR-73	<i>Azardirecta indica</i>	5	73130	28.557378°	76.822956°	Agriculture Field
		<i>Dalbergia sissoo</i>		5	73130	28.557378°	76.822956°	Agriculture Field	
		<i>Dalbergia sissoo</i>		10	73200	28.558475°	76.823160°	Agriculture Field	
		<i>Azardirecta indica</i>		1	73200	28.558475°	76.823160°	Agriculture Field	
		<i>Azardirecta indica</i>		1	73460	28.560405°	76.823261°	Agriculture Field	
		<i>Dalbergia sissoo</i>		1	74010	28.565430°	76.823760°	Agriculture Field	
		<i>Prosopis juliflora</i>		1	74190	28.566875°	76.823861°	Agriculture Field	
		BADLI		<i>Azardirecta indica</i>	1	74710	28.571778°	76.824305°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	75470	28.578379°	76.823207°	Agriculture Field	
			<i>Dalbergia sissoo</i>	10	75600	28.579463°	76.822799°	Agriculture Field	
			<i>Citrus limetta</i>	65	75850	28.581789°	76.822361°	Agriculture Field	
			<i>Psidium guajava</i>	30	75910	28.582291°	76.822226°	Agriculture Field	
			<i>Eucalyptus</i>	3	76070	28.583523°	76.821677°	Road side	
			<i>Dalbergia sissoo</i>	1	76100	28.583864°	76.821391°	Agriculture Field	
			<i>Eucalyptus</i>	2	76100	28.583864°	76.821391°	Road side	
			<i>Dalbergia sissoo</i>	1	76200	28.584870°	76.821699°	Agriculture Field	
			<i>Dalbergia sissoo</i>	3	76400	28.586623°	76.820832°	Agriculture Field	
			<i>Dalbergia sissoo</i>	1	76800	28.589848°	76.819794°	Agriculture Field	
			<i>Dalbergia sissoo</i>	1	77070	28.592038°	76.818869°	Agriculture Field	
			<i>Dalbergia sissoo</i>	4	77170	28.593133°	76.818490°	Agriculture Field	
			<i>Ailanthus excelsa</i>	1	77560	28.596545°	76.817820°	Road side	
			<i>Azardirecta indica</i>	1	77560	28.596545°	76.817820°	Road side	
			<i>Eucalyptus</i>	5	77560	28.596545°	76.817820°	Road side	
			<i>Eucalyptus</i>	1	77670	28.597546°	76.817497°	Road side	
			<i>Eucalyptus</i>	12	77770	28.598456°	76.817121°	Road side	
			<i>Dalbergia sissoo</i>	3	77770	28.598456°	76.817121°	Agriculture Field	
			<i>Dalbergia sissoo</i>	3	78050	28.600887°	76.816347°	Agriculture Field	
		MAJRI-71	<i>Acacia tortilis</i>	2	78700	28.606675°	76.815325°	Agriculture Field	
			<i>Dalbergia sissoo</i>	1	78800	28.607478°	76.815472°	Agriculture Field	
			<i>Acacia tortilis</i>	1	79000	28.609454°	76.815624°	Road side	
		BAHADURGARH	BUPANIA-59	<i>Acacia tortilis</i>	2	80000	28.618346°	76.814449°	Agriculture Field
				<i>Acacia tortilis</i>	2	80670	28.624387°	76.813076°	Road side
				<i>Azardirecta indica</i>	1	80990	28.626969°	76.812884°	Agriculture Field
				<i>Acacia tortilis</i>	1	81450	28.631241°	76.812575°	Agriculture Field
				<i>Acacia tortilis</i>	1	81500	28.631858°	76.812731°	Agriculture Field
				<i>Dalbergia sissoo</i>	1	81880	28.635103°	76.812852°	Agriculture Field
				<i>Acacia tortilis</i>	3	81990	28.636037°	76.812803°	Agriculture Field
				<i>Dalbergia sissoo</i>	1	82270	28.638558°	76.813183°	Agriculture Field
				<i>Dalbergia sissoo</i>	1	82550	28.641062°	76.813457°	Agriculture Field
<i>Dalbergia sissoo</i>	1			82810	28.643537°	76.813619°	Agriculture Field		
<i>Dalbergia sissoo</i>	7			83100	28.646183°	76.813908°	Agriculture Field		

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Dalbergia sissoo</i>	2	83690	28.651405°	76.814407°	Agriculture Field
			<i>Eucalyptus</i>	4	83690	28.651405°	76.814407°	Agriculture Field
		DABODHA KHURD-49	<i>Acacia tortilis</i>	8	84680	28.660023°	76.816919°	Road side
			<i>Azardirecta indica</i>	2	84680	28.660023°	76.816919°	Road side
			<i>Dalbergia sissoo</i>	2	84680	28.660023°	76.816919°	Road side
			<i>Eucalyptus</i>	2	84680	28.660023°	76.816919°	Road side
			<i>Acacia tortilis</i>	2	86190	28.673088°	76.821370°	Agriculture Field
			<i>Eucalyptus</i>	2	86380	28.674677°	76.821554°	Agriculture Field
		MEHANDIPUR-50	<i>Eucalyptus</i>	1	87730	28.686439°	76.825514°	Agriculture Field
		MANDOTHI-53	<i>Dalbergia sissoo</i>	1	88010	28.688738°	76.826683°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	89100	28.697908°	76.830913°	Agriculture Field
			<i>Eucalyptus</i>	3	89100	28.697908°	76.830913°	Road side
			<i>Azardirecta indica</i>	2	89590	28.701882°	76.832712°	Agriculture Field
			<i>Acacia tortilis</i>	5	89650	28.702218°	76.833162°	Road side
			<i>Dalbergia sissoo</i>	3	89890	28.703997°	76.834797°	Agriculture Field
			<i>Dalbergia sissoo</i>	12	90650	28.708755°	76.840253°	Agriculture Field
			<i>Dalbergia sissoo</i>	3	92420	28.722710°	76.845998°	Agriculture Field
			<i>Azardirecta indica</i>	2	92500	28.723495°	76.846063°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	92630	28.724419°	76.845291°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	92730	28.725164°	76.845208°	Agriculture Field
			<i>Syzygium cumini</i>	1	92930	28.727071°	76.845395°	Agriculture Field
			<i>Eucalyptus</i>	1	92930	28.727071°	76.845395°	Road side
			<i>Dalbergia sissoo</i>	1	93250	28.729644°	76.846242°	Agriculture Field
			<i>Dalbergia sissoo</i>	3	93350	28.730625°	76.846626°	Agriculture Field
		JAKHODA-41 (New)	<i>Dalbergia sissoo</i>	40	93450	28.731481°	76.846842°	
			<i>Eucalyptus</i>	25	93550	28.732353°	76.847131°	
		ASAUDHA TODRAN-28	<i>Syzygium cumini</i>	1	94110	28.737285°	76.849157°	Factory Side
			<i>Syzygium cumini</i>	1	94460	28.740038°	76.850574°	Road side
			<i>Eucalyptus</i>	2	94590	28.741034°	76.850938°	Railway Line Side
			<i>Eucalyptus</i>	1	94590	28.741034°	76.850938°	Railway Line Side
			<i>Eucalyptus</i>	1	94600	28.741337°	76.851038°	Railway Line Side
			<i>Eucalyptus</i>	8	94660	28.741632°	76.851383°	Railway Line Side
			<i>Eucalyptus</i>	8	94660	28.741632°	76.851383°	Railway Line Side
			<i>Dalbergia sissoo</i>	5	95000	28.744478°	76.852302°	Agriculture Field
			<i>Dalbergia sissoo</i>	4	95090	28.745150°	76.852805°	Agriculture Field
			<i>Dalbergia sissoo</i>	7	95880	28.751713°	76.856007°	Agriculture Field
			<i>Dalbergia sissoo</i>	10	96280	28.755059°	76.857865°	Agriculture Field
			<i>Ficus religiosa</i>	1	96370	28.755791°	76.858326°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	96390	28.755875°	76.858664°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	96390	28.755875°	76.858664°	Road side
<i>Syzygium cumini</i>	1		96390	28.755875°	76.858664°	Road side		
<i>Morus nigra</i>	1		96490	28.756566°	76.859125°	Agriculture Field		

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						Latitude	Longitude	
			<i>Ficus religiosa</i>	1	96490	28.756566°	76.859125°	Road side
			<i>Holoptela intigriafolia</i>	16	96590	28.757270°	76.859788°	Agriculture Field
			<i>Psidium guajava</i>	4	96590	28.757270°	76.859788°	Agriculture Field
			<i>Morus nigra</i>	2	96590	28.757270°	76.859788°	Road side
			<i>Morus nigra</i>	2	97120	28.761576°	76.862416°	Agriculture Field
			<i>Azardirecta indica</i>	1	97260	28.762555°	76.863185°	Agriculture Field
			<i>Syzygium cumini</i>	2	97420	28.763906°	76.864109°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	97690	28.765821°	76.865465°	Agriculture Field
			<i>Dalbergia sissoo</i>	4	97750	28.766349°	76.865786°	Agriculture Field
			<i>Dalbergia sissoo</i>	8	98050	28.768616°	76.867413°	Agriculture Field
			<i>Azardirecta indica</i>	7	98190	28.769651°	76.868012°	Road side
		JASOUR KHERI-17	<i>Prosopis cineraria</i>	1	98470	28.771983°	76.869265°	Agriculture Field
			<i>Azardirecta indica</i>	1	98530	28.772585°	76.869596°	Agriculture Field
			<i>Eucalyptus</i>	1	98880	28.775444°	76.871110°	Agriculture Field
			<i>Eucalyptus</i>	1	98880	28.775444°	76.871110°	Agriculture Field
			<i>Syzygium cumini</i>	2	99100	28.777220°	76.872036°	Agriculture Field
			<i>Syzygium cumini</i>	3	99150	28.777600°	76.872408°	Agriculture Field
			<i>Azardirecta indica</i>	1	99300	28.778840°	76.873138°	Agriculture Field
			<i>Syzygium cumini</i>	4	99300	28.778840°	76.873138°	Agriculture Field
			<i>Ficus racemosa</i>	1	99350	28.779168°	76.873191°	Agriculture Field
			<i>Syzygium cumini</i>	3	99350	28.779168°	76.873191°	Agriculture Field
			<i>Eucalyptus</i>	3	99380	28.779428°	76.873369°	Agriculture Field
			<i>Albizia lebbek</i>	2	99430	28.779974°	76.873645°	Road side
			<i>Syzygium cumini</i>	8	99430	28.779974°	76.873645°	Road side
			<i>Dalbergia sissoo</i>	1	99930	28.783921°	76.875773°	Agriculture Field
		<i>Eucalyptus</i>	10	99930	28.783921°	76.875773°	Road side	
		<i>Dalbergia sissoo</i>	1	100000	28.784607°	76.876408°	Agriculture Field	
		KHERI JASOUR-18	<i>Pyrus persica</i>	1	100100	28.785332°	76.876785°	Agriculture Field
			<i>Syzygium cumini</i>	1	100800	28.791232°	76.879486°	Agriculture Field
			<i>Mangifera indica</i>	2	100880	28.791634°	76.880038°	Agriculture Field
			<i>Dalbergia sissoo</i>	6	100950	28.792732°	76.880357°	Agriculture Field
			<i>Pyrus persica</i>	3	101150	28.793838°	76.881055°	Agriculture Field
			<i>Prosopis cineraria</i>	1	101730	28.798649°	76.883810°	Agriculture Field
NILOTHI-19	<i>Dalbergia sissoo</i>	3	101930	28.800279°	76.884848°	Agriculture Field		
	<i>Dalbergia sissoo</i>	9	102000	28.800736°	76.885269°	Agriculture Field		
	<i>Azardirecta indica</i>	2	102100	28.801386°	76.885969°	Agriculture Field		
	<i>Dalbergia sissoo</i>	5	102100	28.801386°	76.885969°	Agriculture Field		
	<i>Dalbergia sissoo</i>	2	102250	28.802433°	76.886805°	Agriculture Field		
	<i>Ziziphus mauritiana</i>	1	102250	28.802433°	76.886805°	Agriculture Field		
	<i>Dalbergia sissoo</i>	1	102250	28.804065°	76.888464°	Agriculture Field		
SONI PAT	KHA RKH ODA	KIRALI	<i>Dalbergia sissoo</i>	2	102650	28.805113°	76.889650°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	102730	28.805615°	76.890207°	Agriculture Field

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Ficus religiosa</i>	1	102730	28.805615°	76.890207°	Agriculture Field
			<i>Syzygium cumini</i>	2	102730	28.805615°	76.890207°	Agriculture Field
			<i>Acacia nilotica</i>	2	102920	28.806977°	76.891471°	Agriculture Field
			<i>Acacia tortilis</i>	2	102920	28.806977°	76.891471°	Agriculture Field
			<i>Acacia tortilis</i>	1	103000	28.807494°	76.891862°	Agriculture Field
		PAI	<i>Syzygium cumini</i>	1	103410	28.810565°	76.894417°	Agriculture Field
			<i>Acacia tortilis</i>	2	104350	28.816810°	76.900634°	Agriculture Field
			<i>Acacia tortilis</i>	4	104460	28.817539°	76.901407°	Agriculture Field
			<i>Prosopis cineraria</i>	1	105010	28.821239°	76.905309°	Agriculture Field
		PRAHLADPUR	<i>Acacia tortilis</i>	1	105150	28.822050°	76.906205°	Agriculture Field
			<i>Azardircta indica</i>	1	105150	28.822050°	76.906205°	Agriculture Field
			<i>Ficus religiosa</i>	1	105150	28.822050°	76.906205°	Agriculture Field
			<i>Prosopis cineraria</i>	1	105150	28.822050°	76.906205°	Agriculture Field
			<i>Dalbergia sissoo</i>	9	105250	28.822707°	76.906919°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	105350	28.823472°	76.907648°	Agriculture Field
			<i>Syzygium cumini</i>	1	105450	28.824008°	76.908333°	Agriculture Field
			<i>Azardircta indica</i>	4	105100 to 105150	28.822114°	76.906323°	Orchard
			<i>Mangifera inidca</i>	2	105100 to 105150	28.822114°	76.906323°	Orchard
			<i>Psidium guajava</i>	80	105100 to 105150	28.822114°	76.906323°	Orchard
			<i>Syzygium cumini</i>	6	105100 to 105150	28.822114°	76.906323°	Orchard
		<i>Ziziphus mauritiana</i>	3	105100 to 105150	28.822114°	76.906323°	Orchard	
		BARONA	<i>Acacia tortilis</i>	16	105940-106200	28.828071°	76.912715°	IMT
			<i>Acacia tortilis</i>	25	106200-106600	28.830649°	76.916095°	IMT
			<i>Acacia tortilis</i>	15	106000 to 106200	28.828286°	76.913082°	IMT
			<i>Acacia tortilis</i>	30	106600 to 106800	28.831980°	76.917553°	IMT
		GOPALPUR	<i>Dalbergia sissoo</i>	2	106800	28.832574°	76.918335°	IMT
			<i>Dalbergia sissoo</i>	2	106860	28.832910°	76.918714°	IMT
			<i>Acacia tortilis</i>	70	107000-108000	28.838565°	76.925695°	IMT
			<i>Dalbergia sissoo</i>	2	1080100	28.840543°	76.928120°	IMT
			<i>Acacia tortilis</i>	5	1080800	28.844825°	76.933383°	IMT
		PIPLI	<i>Dalbergia sissoo</i>	2	1090090	28.846529°	76.935415°	IMT
			<i>Syzygium cumini</i>	1	1090200	28.847015°	76.936841°	IMT
			<i>Syzygium cumini</i>	1	1090300	28.847678°	76.937549°	IMT
			<i>Dalbergia sissoo</i>	1	110410	28.855158°	76.945097°	Agriculture Field
			<i>Acacia tortilis</i>	8	110420	28.855029°	76.945479°	Road side
			<i>Azardircta indica</i>	1	110420	28.855029°	76.945479°	Road side
			<i>Syzygium cumini</i>	1	110420	28.855029°	76.945479°	Road side
			<i>Dalbergia sissoo</i>	6	110550	28.855757°	76.946154°	Agriculture Field
			<i>Phyllanthus emblica</i>	2	110550	28.855757°	76.946154°	Agriculture Field
			<i>Saraca asoca</i>	1	110550	28.855757°	76.946154°	Agriculture Field
			<i>Syzygium cumini</i>	15	110550	28.855757°	76.946154°	Agriculture Field
<i>Ziziphus mauritiana</i>	6	110550	28.855757°	76.946154°	Agriculture Field			

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Psidium guajava</i>	500	110550	28.855757°	76.946154°	Orchard
			<i>Punica protopunica</i>	2	110550	28.855757°	76.946154°	Orchard
			<i>Holoptela intigriafolia</i>	1	110550	28.855757°	76.946154°	Road side
			<i>Morus nigra</i>	1	111950	28.864715°	76.956412°	Orchard
			<i>Acacia nilotica</i>	10	106800 to 107900	28.832285°	76.918009°	IMT
			<i>Acacia tortilis</i>	20	108500 to 108700	28.843549°	76.931975°	IMT
			<i>Casurina</i>	120	110100 to 110200	28.853277°	76.943278°	IMT
			<i>Acacia tortilis</i>	20	110200 to 110300	28.853920°	76.944003°	IMT
			<i>Dalbergia sissoo</i>	20	110200 to 110300	28.853920°	76.944003°	IMT
		THANA KALAN	<i>Eucalyptus</i>	250	112570	28.868614°	76.960777°	Orchard
			<i>Citrus limon</i>	10	112800	28.870281°	76.962593°	Orchard
			<i>Dalbergia sissoo</i>	1	112800	28.870281°	76.962593°	Orchard
			<i>Psidium guajava</i>	60	112800	28.870281°	76.962593°	Orchard
			<i>Syzygium cumini</i>	33	112800	28.870281°	76.962593°	Orchard
			<i>Dalbergia sissoo</i>	2	112900	28.870839°	76.963249°	Agriculture Field
			<i>Syzygium cumini</i>	2	112900	28.870839°	76.963249°	Agriculture Field
			<i>Ziziphus mauritiana</i>	1	112900	28.870839°	76.963249°	Agriculture Field
			<i>Acacia tortilis</i>	50	112900	28.871451°	76.964024°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	113200	28.872822°	76.965476°	Agriculture Field
			<i>Dalbergia sissoo</i>	1	113670	28.875475°	76.968931°	Agriculture Field
			<i>Eucalyptus</i>	70	113700	28.875774°	76.969452°	Agriculture Field
			<i>Azardircta indica</i>	1	113700	28.875774°	76.969452°	Agriculture Field
			<i>Manilkara zapota</i>	150	113000 to 113200	28.871384°	76.964066°	Orchard
			<i>Eucalyptus</i>	5	113700	28.875774°	76.969452°	Agriculture Field
		TURAKPUR	<i>Dalbergia sissoo</i>	1	113900	28.877020°	76.970722°	Agriculture Field
			<i>Azardircta indica</i>	1	114300	28.879358°	76.973946°	Agriculture Field
			<i>Syzygium cumini</i>	1	114300	28.879358°	76.973946°	Agriculture Field
			<i>Azardircta indica</i>	1	114450	28.880324°	76.974762°	Agriculture Field
			<i>Dalbergia sissoo</i>	4	114450	28.880324°	76.974762°	Agriculture Field
			<i>Acacia tortilis</i>	5	114730	28.881876°	76.977168°	Agriculture Field
		TURAKPUR	<i>Dalbergia sissoo</i>	3	115110	28.884508°	76.979910°	Agriculture Field
		MANDORA	<i>Pyrus persica</i>	2	115570	28.887406°	76.982926°	Agriculture Field
			<i>Azardircta indica</i>	7	115710	28.888277°	76.984168°	Agriculture Field
			<i>Prosopis cineraria</i>	2	115710	28.888277°	76.984168°	Agriculture Field
			<i>Eucalyptus</i>	6	115870	28.889184°	76.985425°	Agriculture Field
			<i>Pyrus persica</i>	1	115940	28.889790°	76.985695°	Agriculture Field
			<i>Azardircta indica</i>	1	115990	28.889941°	76.986340°	Agriculture Field
			<i>Dalbergia sissoo</i>	3	116150	28.890830°	76.987525°	Agriculture Field
			<i>Azardircta indica</i>	1	116150	28.890830°	76.987525°	Agriculture Field
			<i>Dalbergia sissoo</i>	2	116150	28.890830°	76.987525°	Agriculture Field
<i>Azardircta indica</i>	1		116550	28.892654°	76.990875°	Agriculture Field		
<i>Dalbergia sissoo</i>	1	116660	28.893112°	76.992001°	Agriculture Field			

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use	
						Latitude	Longitude		
			<i>Ficus religiosa</i>	1	116660	28.893112°	76.992001°	Agriculture Field	
			<i>Holoptela intigriafolia</i>	2	116660	28.893112°	76.992001°	Agriculture Field	
			<i>Dalbergia sissoo</i>	2	116860	28.893623°	76.994027°	Agriculture Field	
			<i>Azardircta indica</i>	1	117340	28.894690°	76.998713°	Agriculture Field	
			<i>Azardircta indica</i>	1	117480	28.894720°	77.000205°	Agriculture Field	
			<i>Azardircta indica</i>	1	117610	28.895275°	77.001395°	Agriculture Field	
			<i>Dalbergia sissoo</i>	15	118800	28.897140°	77.013535°	Agriculture Field	
			<i>Eucalyptus</i>	90	118800	28.897140°	77.013535°	Agriculture Field	
			<i>Prosopis cineraria</i>	1	118800	28.897140°	77.013535°	Agriculture Field	
			<i>Acacia tortilis</i>	1	118900	28.897345°	77.014308°	Along nahar Road Side	
			<i>Albizzia lebbek</i>	18	118900	28.897345°	77.014308°	Along nahar Road Side	
			<i>Dalbergia sissoo</i>	16	118900	28.897345°	77.014308°	Along nahar Road Side	
			<i>Eucalyptus</i>	30	118900	28.897345°	77.014308°	Along nahar Road Side	
			SONIPAT	NAHRA		<i>Azardircta indica</i>	2	119300	28.898258°
	MAHLA MAJRA			<i>Acacia tortilis</i>	4	119690	28.899057°	77.022240°	
		<i>Dalbergia sissoo</i>		2	119810	28.899280°	77.023701°		
		<i>Azardircta indica</i>		1	120020	28.899595°	77.025738°	Agriculture Field	
		<i>Dalbergia sissoo</i>		6	120130	28.899788°	77.026732°	Agriculture Field	
		<i>Phoenix dactylifera</i>		2	120520	28.900565	77.030721°	Agriculture Field	
	CHHATEHRA BHADURPUR			<i>Dalbergia sissoo</i>	10	121050	28.901426°	77.036067°	Agriculture Field
		<i>Dalbergia sissoo</i>		5	121190	28.901857°	77.037287°	Agriculture Field	
		<i>Dalbergia sissoo</i>		1	121190	28.901857°	77.037287°	Agriculture Field	
		<i>Azardircta indica</i>		2	121190	28.901857°	77.037287°	Agriculture Field	
		<i>Acacia tortilis</i>		1	121220	28.901999°	77.037733°	Agriculture Field	
		<i>Azardircta indica</i>		3	121220	28.901999°	77.037733°	Agriculture Field	
		<i>Melia azedarach</i>		25	121050	28.901587°	77.036069°	Road side	
		<i>Azardircta indica</i>		3	121190	28.901857°	77.037287°	Agriculture Field	
		<i>Dalbergia sissoo</i>		2	121190	28.901857°	77.037287°	Agriculture Field	
		<i>Acacia tortilis</i>		1	121220	28.901999°	77.037733°	Agriculture Field	
	<i>Acacia tortilis</i>	1		121280	28.902236°	77.038254°	Agriculture Field		
	<i>Acacia tortilis</i>	1		121540	28.902238°	77.040889°	Agriculture Field		
	<i>Syzygium cumini</i>	4		121600	28.902329°	77.041578°	Agriculture Field		
	MAHLA MAJRA			<i>Dalbergia sissoo</i>	6	121760	28.903035°	77.043074°	Agriculture Field
	RAI	AKBARPUR BAROTA	<i>Holoptela intigriafolia</i>	2	122590	28.905515°	77.050903°	Orchard	
			<i>Dalbergia sissoo</i>	5	123080	28.909076°	77.053567°	Road side	
			<i>Azardircta indica</i>	4	123410	28.912102°	77.053905°	Agriculture Field	
			<i>Morus nigra</i>	1	123410	28.912102°	77.053905°	Agriculture Field	
	SONIPAT	JAGDISHPUR	<i>Azardircta indica</i>	5	124200	28.918861°	77.051261°	IR SIDE	
			<i>Acacia tortilis</i>	8	124200	28.918861°	77.051261°	Road side	
			<i>Acacia tortilis</i>	2	124200	28.918861°	77.051261°	IR SIDE	
			<i>Acacia tortilis</i>	2	124300	28.919630°	77.050796°	IR SIDE	
			<i>Azardircta indica</i>	2	124300	28.919630°	77.050796°	IR SIDE	

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>Eucalyptus</i>	6	124300	28.919630°	77.050796°	IR SIDE
			<i>Eucalyptus</i>	10	124390	28.920158°	77.050470°	IR SIDE
			<i>Eucalyptus</i>	10	124450	28.920905°	77.050289°	IR SIDE
			<i>Eucalyptus</i>	11	114500	28.921307°	77.050017°	IR SIDE
			<i>Eucalyptus</i>	16	124600	28.922182°	77.049569°	IR SIDE
			<i>Eucalyptus</i>	8	124600	28.922182°	77.049569°	IR SIDE
			<i>Azardirecta indica</i>	1	124690	28.922822°	77.049479°	IR SIDE
			<i>Azardirecta indica</i>	5	124750	28.923373°	77.049199°	IR SIDE
			<i>Azardirecta indica</i>	2	124890	28.924530°	77.048648°	IR SIDE
			<i>Dalbergia sissoo</i>	5	125050	28.925853°	77.047972°	IR SIDE
			<i>Dalbergia sissoo</i>	1	125170	28.926848°	77.047486°	IR SIDE
			<i>Azardirecta indica</i>	1	125430	28.929102°	77.046380°	IR SIDE
			<i>Dalbergia sissoo</i>	6	125700	28.931240°	77.045268°	IR SIDE
			<i>mangifera indica</i>	3	125700	28.931240°	77.045268°	IR SIDE
			<i>Dalbergia sissoo</i>	1	125850	28.932517°	77.044682°	IR SIDE
			<i>Ficus religiosa</i>	1	125850	28.932517°	77.044682°	IR SIDE
			<i>Prosopis cineraria</i>	1	125850	28.932517°	77.044682°	IR SIDE
			<i>Dalbergia sissoo</i>	4	126000	28.933802°	77.044101°	IR SIDE
			<i>Ficus religiosa</i>	1	126000	28.933802°	77.044101°	IR SIDE
			<i>Eucalyptus</i>	16	126000-126500	28.934830°	77.043507°	IR SIDE
			<i>Acacia tortilis</i>	5	126000-126500	28.934830°	77.043507°	IR SIDE
			<i>Dalbergia sissoo</i>	18	126000-126500	28.934830°	77.043507°	IR SIDE
			<i>Eucalyptus</i>	44	126000-126500	28.934830°	77.043507°	IR SIDE
			<i>Eucalyptus</i>	42	126000-126500	28.934830°	77.043507°	IR SIDE
			<i>Acacia tortilis</i>	5	126000-126500	28.939035°	77.041359°	IR SIDE
			<i>Acacia tortilis</i>	20	126000-126500	28.939974°	77.040987°	IR SIDE
		NASIRPUR BANGAR	<i>Morus nigra</i>	4	127100	28.942875°	77.039617°	IR SIDE
			<i>Eucalyptus</i>	55	126500 To 126700	28.938310°	77.041673°	IR SIDE
			<i>Eucalyptus</i>	33	126700 to 126800	28.940056°	77.040925°	IR SIDE
			<i>Eucalyptus</i>	66	127000 to 127100	28.942444°	77.039817°	IR SIDE
			<i>Melia azedarach</i>	20	127000 to 127100	28.942444°	77.039817°	IR SIDE
		HARSANA KHURD	<i>Acacia tortilis</i>	50	127000-127500	28.944400°	77.038821°	IR SIDE
			<i>Mangifera indica</i>	1	127460	28.945821°	77.038115°	IR SIDE
			<i>Syzygium cumini</i>	1	127460	28.945821°	77.038115°	IR SIDE
			<i>Azardirecta indica</i>	30	127100 to 127500	28.944423°	77.038822°	IR SIDE
			<i>Ficus religiosa</i>	2	127100 to 127500	28.944423°	77.038822°	IR SIDE
			<i>Melia azedarach</i>	10	127100 to 127500	28.944423°	77.038822°	IR SIDE
			<i>Syzygium cumini</i>	3	127100 to 127500	28.944423°	77.038822°	IR SIDE
		HARSANA KALAN	<i>Ficus religiosa</i>	2	127670	28.947576°	77.037335°	IR SIDE
			<i>Melia azedarach</i>	4	127670	28.947576°	77.037335°	IR SIDE
			<i>Pongamia pinnata</i>	5	127670	28.947576°	77.037335°	IR SIDE
			<i>Azardirecta indica</i>	1	127700	28.947840°	77.037110°	IR SIDE

Name of District	Name of Tehsil	Name of Village	Name of Plant	Number of Plants	Chainage (in M)	GPS Location		Type of land use
						Latitude	Longitude	
			<i>mangifera indica</i>	3	127750	28.948299°	77.036909°	IR SIDE
			<i>Ziziphus mauritiana</i>	2	127750	28.948299°	77.036909°	IR SIDE
			<i>Acacia tortilis</i>	3	127800	28.948671°	77.036742°	IR SIDE
			<i>Azardirecta indica</i>	2	127800	28.948671°	77.036742°	IR SIDE
			<i>Psidium guajava</i>	1	127800	28.948671°	77.036742°	IR SIDE
			<i>Azardirecta indica</i>	1	127850	28.949023°	77.036521°	IR SIDE
			<i>Desi Neem</i>	1	127850	28.949023°	77.036521°	IR SIDE
			<i>Holoptela intigriafolia</i>	5	127850	28.949023°	77.036521°	IR SIDE
			<i>Musa paradisiaca</i>	6	127850	28.949023°	77.036521°	IR SIDE
			<i>Ficus religiosa</i>	2	127900	28.949495°	77.036321°	IR SIDE
			<i>Syzygium cumini</i>	2	127900	28.949495°	77.036321°	IR SIDE
			<i>Acacia tortilis</i>	3	127950	28.949954°	77.036100°	IR SIDE
			<i>Ficus religiosa</i>	1	128000	28.950335°	77.035907°	IR SIDE
TOTAL				6499				

CLIMATE RISK AND VULNERABILITY ASSESSMENT

1.0 PROJECT SUMMARY

Project Title	Haryana Orbital Rail Corridor (HORC) from Palwal to Sonipat in the State of Haryana
Project Cost	INR 5618 Crore
Location	Project alignment passes through 5 Districts i.e. Palwal, Nuh, Gurugram, Jhajjar and Sonipat in the state of Haryana, India
Sector	SECTION H: Transportation and Storage
Theme	Inclusive economic growth; Environmentally sustainable growth
Brief Description	The route length of proposed alignment is 121.742 km and total length is 143.932 Km (including Connectivity to the existing Stations on Indian Railway) connecting Palwal to Sonipat. The proposed project will have 14 stations viz. New Prithla, Silani, Sohna, Dhulawat, Chandla Dungerwas, Manesar, New Patli, Badsa, Deverkhana, Badli, Mandothi, JasurKheri, Kharkhoda Kirholi and Tarakpur. Out of 14 new stations, 4 (Four) are Junction Stations namely Manesar, New Patli, Badsa and Mandothi proposed with proper connectivity with IR stations. The average inter distance between stations is 8.696 Kms. About 95 km of the Proposed alignment runs parallel to Kundli – Manesar - Palwal (KMP) Expressway near Sohna-Manesar-Harsana Kalan stretch. It will be an electrified broad gauge double railway line with an annual capacity of 60 million tons of freight and 7 million passengers.

2.0 PROJECT CLIMATE RISK SCREENING

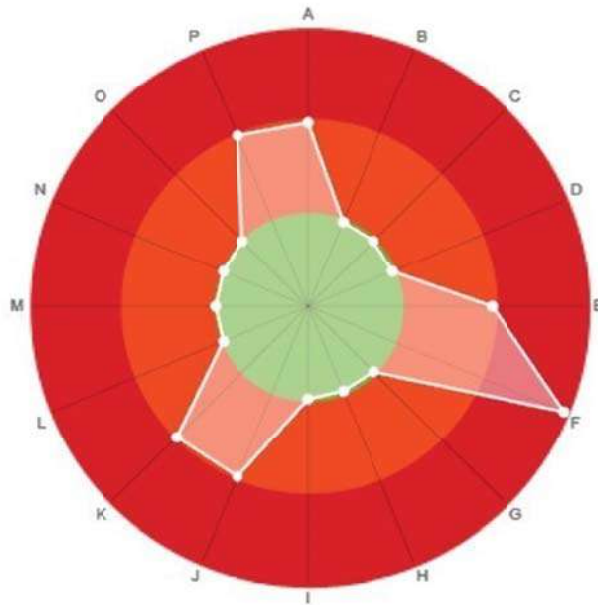
The climate risk screening is based on the Aware™ geographic data set, compiled from the latest scientific information on current geological, climate and related hazards together with projected changes for the future where available. These data are combined with the project's sensitivities to hazard variables, returning information on the current and potential future risks that could influence its design and planning

Climate Risk Classification: *Medium Risk*

Climate Risk Screening Tool and/or Procedure Used: Aware™ geographic data set

Below chart gives the level of risk associated with each individual climate risk topic analysed in Aware™. Projects with a final "High risk" rating are always recommended for further more detailed climate risk analysis. The radar chart provides an overview of which individual risks is most significant. The red band (outer circle) suggests a higher level of risk in relation to a risk topic. The green band (inner circle) suggests a lower level of risk in relation to a risk topic.

Breakdown of climate risk topic ratings



A) Temperature increase
B) Wild fire
C) Permafrost
D) Sea ice
E) Precipitation increase
F) Flood
G) Snow loading
H) Landslide
I) Precipitation decrease
J) Water availability
K) Wind speed increase
L) Onshore Category 1 storms
M) Offshore Category 1 storms
N) Wind speed decrease
O) Sea level rise
P) Solar radiation change

RISK ANALYSIS

In the following paragraphs risk analysis is given for various climate parameters based on Aware™.

A) TEMPERATURE INCREASE (Medium Risk)

- Climate model projections agree that annual average temperature increase in the project location
- There is a potential for an increase in incidences where current design standards will not be sufficient
- The design, operational and maintenance standards should be reviewed taking into consideration current impacts of high temperatures as well as potential future changes
- Heat waves put stress on buildings and other infrastructure
- Warm weather can raise surface water temperatures of water bodies which could impact local eco-systems, improving the growing conditions for algae and potentially harmful micro-organisms in water courses
- Heat waves can have an impact on agricultural productivity and growing seasons
- High temperatures can have implications for energy security. Peak energy demand due to demand for cooling can exceed incremental increases on base load in addition to the risk of line outages and blackouts
- Human health can be affected by warmer periods. For example, urban air quality and disease transmission (e.g. malaria and dengue fever) can be impacted by higher air temperatures
- Wildfire risk is elevated during prolonged warm periods that dry fuels, promoting easier ignition and faster spread.

B) PRECIPITATION INCREASE (Medium Risk)

- There is a potential for an increase in incidences where current design standards will not be sufficient

- Climate model projections do not agree that annual average precipitation will increase in the project location which could indicate a relatively high degree of uncertainty. On the other hand, this could also mean precipitation patterns are not expected to change or may even decrease
- An increase in precipitation require that the design of the project may have to be slightly modified to cope with the impact of increased precipitation
- The design, operational and maintenance standards should be reviewed
- Seasonal runoff may lead to erosion and siltation of water courses, lakes and reservoirs.
- Flooding and precipitation induced landslide events

C) **FLOOD (High Risk):** The project is located in a region which has experienced recurring major flood events in the recent past. A high exposure in Aware means that between 1985 and 2016 there has been at least one significant, large-scale flood event in the region. This is based on post-processed data from the Dartmouth Flood Observatory at the University of Colorado.

- The design, operational and maintenance standards should be reviewed if floods are identified as a potential problem for the project

D) WATER AVAILABILITY (Medium Risk)

Data suggest that the project is located in a region where there may be future water stress (2020s - 2050s).

- No modifications are required due to decrease in water availability. The design of the project would be unaffected by reductions in water availability
- The situation may be exacerbated if there is increased competition for water with other users in the area and changes in local demographics
- Regions that are already dry may suffer further if future precipitation is projected to decrease
- Increased evaporation due to rising temperature will further impact on water availability
- Existing engineering designs may not take into consideration the impact of climate change on the risks from water availability and design standards may not be met

E) WIND SPEED INCREASE (Medium Risk)

- The design of the project may have to be slightly modified to cope with the impact of increased average and maximum wind speed
- The design, operational and maintenance standards should be reviewed taking into consideration current impacts of increasing wind speed as well as potential future changes
- The design and operation of certain infrastructure is determined by the prevailing climatic wind conditions

F) SOLAR RADIATION CHANGE (Medium Risk)

- There is a potential for incidences where current design standards will not be sufficient or met
- Design of the project may have to be slightly modified to cope with the impact of changes in solar radiation

- The design, operational and maintenance standards should be reviewed taking into consideration current impacts of fluctuating solar radiation as well as potential future changes
- Medium (yearly, seasonal) or longer term variations in solar radiation at the Earth's surface can affect for example:
 - Agricultural yields
 - Rates of photosynthesis (and therefore growing season)
 - Solar power potential
 - The rate of degeneration of building materials

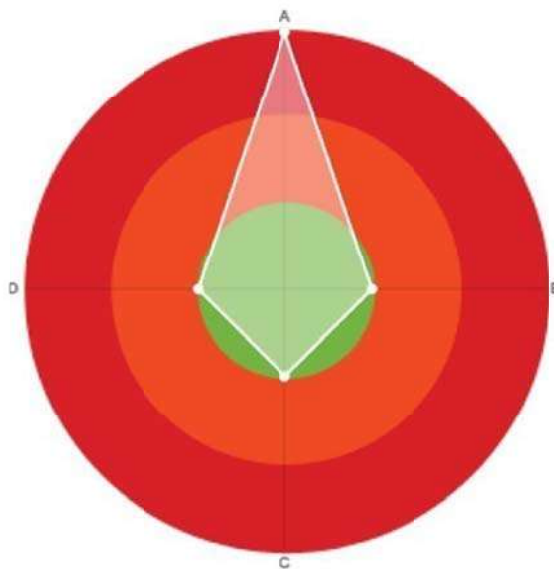
G) PRECIPITATION DECREASE (LOW RISK)

- Climate model projections do not agree that annual average precipitation will decrease in the project location which could indicate a relatively high degree of uncertainty
- The design of the project would be unaffected by decreases in precipitation
- Decreased seasonal runoff may exacerbate pressures on water availability, accessibility and quality
- Variability of river runoff may be affected such that extremely low runoff events (i.e. drought) may occur much more frequently
- Increased risk of drought conditions could lead to accelerated land degradation, expanding desertification and more dust storms

3.0 PROJECT GEOLOGICAL RISK ASSESSMENT

Hazard risk ratings: *Medium Risk*

Breakdown of geological hazard risk topic ratings



A) Earthquake
B) Seismic landslide
C) Tsunami
D) Volcano

EARTHQUAKE: (High Risk)

Data suggest that the project is located in a region where Peak Ground Acceleration (PGA) of >31 cm/s may be expected from a 250yr return period event, potentially leading to moderate to heavy damage. This is based on post-processed data from International Centre for Numerical Methods in Engineering (CIMNE) and INGENIAR Ltda (GAR15).

- Earthquake risk is dependent on several factors including the characteristics of the hazard, exposure of assets and population to the hazard, and vulnerabilities
- Distance away from the epicentre
- Depth of the earthquake
- Local geology
- Duration of the shaking
- Population density
- Land use characteristics
- Design standards, construction quality and materials, and maintenance standards of infrastructure and assets.
- The project design and construction features ensures that the structures can adequately resist seismic forces during earthquakes

4.0 PROJECT AREA DESCRIPTION (CLIMATE, OBSERVED TRENDS, AND CLIMATE CHANGE)

The State Haryana which roughly lies in the area bounded by 27°39', 31°N latitudes and 74°31', 77°30'E longitudes forms the eastern part of the table land between the Sutlej and the Yamuna the south of the former river and to north of Rajasthan desert. The state has the Yamuna on its eastern border and on the north Himachal Pradesh, while it adjoins Rajasthan desert on south and southwest and Punjab on the northwest. There are three main physical divisions in the state namely, the Himalayan sub-mountain areas which stretches from the Yamuna to the Salt Range, the arid South-western plains and the western portion of the Indo-Gangetic Plain that constitutes the central portion of the state. The whole of Haryana consists of a vast alluvial plain except in the northeast region which falls under Himalayan sub-mountain region. There is no other mountain system of importance in the state but a few unimportant outliers the Aravali system pass of across Gurgaon District in the extreme southeast and terminate in the Ridge at Delhi.

4.1 Rainfall Data:

Some of the important result of the rainfall pattern and it its variability on recent 30 years data of Haryana shows that:

- Haryana gets maximum rainfall in August (33% of SW monsoon rainfall) followed by July (32 % of SW monsoon rainfall).
- 82% of annual rainfall receives during southwest monsoon rainfall (June – September).
- No significant increasing/decreasing trends in June monthly rainfall.
- Number of dry days is maximum over central and Southern parts of the state (87-92) dry days out of 122 days during the SW monsoon season while on an average 289-300 dry days in 365 days have been noticed in many parts of state.

Table 1 shows the mean rainfall (mm) and coefficient of variation of the state for the monsoon months, southwest monsoon season and annual during the period 1989-2018. It can be seen that the state gets highest rainfall (33%) of south west monsoon rainfall in August month while the July month get 32% of the south west monsoon rainfall. June and September receive 14% and 21% of south west monsoon rainfall. Also more than 82% of annual rainfall receives during the southwest monsoon season only. The variability of monsoon or annual rainfall is 31% and 27% respectively.

Table 1: Mean Rainfall (mm) and Coefficient of Variation of The State For The Monsoon Months, Southwest Monsoon Season And Annual

Particular	June	July	August	September	JJAS	Annual
Mean	57.7	130.9	137.5	84.5	410.6	499.7
CV	70.6	52.7	58.4	64.8	31.0	27.2

Fig. 1 and 2 show the time series of rainfall in mm for the months of June, July, August, September and southwest monsoon season, annual respectively.

- Seasonal and annual rainfall shows decreasing trend
- In the monthly rainfall, June show increasing trend while July, August and September rainfall show decreasing trend.
- Neither monthly nor seasonal/annual trend is significant statistically
- During the last 30 years highest rainfall of June received in the year 2008 (201.4mm)
- During the last 30 years highest rainfall of July received in the year 1994 (280.5 mm)
- Highest rainfall of 401.2mm in August received in the year 1995
- Highest rainfall of 181.4mm in September received in the year 1990
- Highest annual rainfall of 840.6 mm and highest southwest monsoon rainfall of 754.1 mm received in the year 1995

Fig. 1: Time Series of Rainfall in mm for The Months of June, July, August, September And Trend

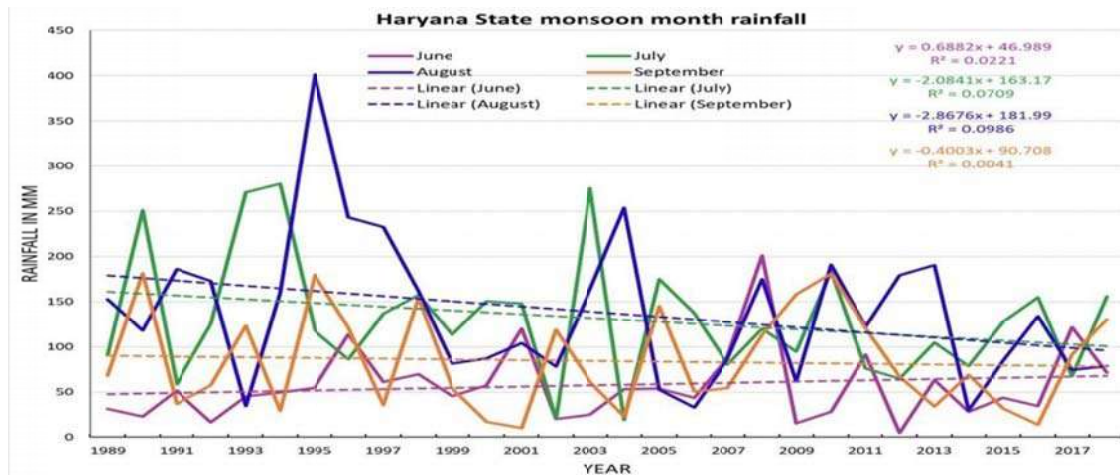
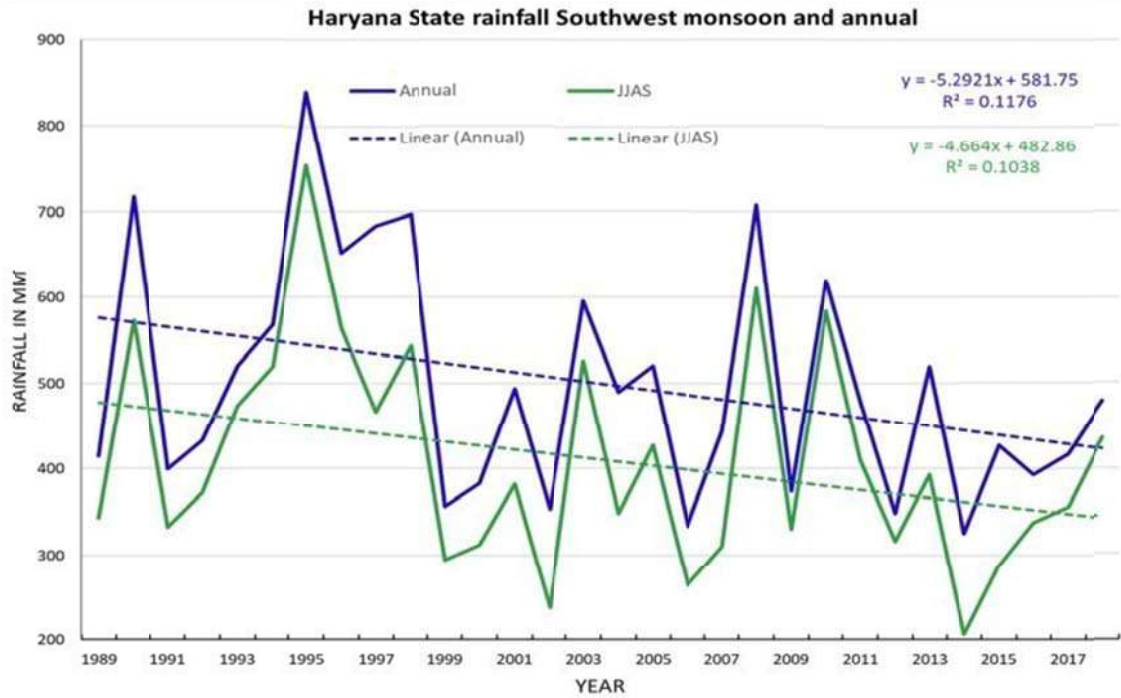


Fig. 2: Time Series of Rainfall In mm For The Southwest Monsoon Season And Annual Trends



4.2 Temperature

The state of Haryana shows a spatial as well as temporal variability. **Table 2** gives the summary of annual and seasonal temperature statistics. As seen in **Table 2**, seasonal average maximum temperature is higher during pre-monsoon and monsoon season and ranges between 35.4°C to 36.2°C. Similarly seasonal average minimum temperature is lowest during winter period and ranges from 6.9°C to 7.6°C.

Table 2: Observed Temperature Statistics Average Over the Time Period 1969-2005 For Haryana

Season	Statistics	Maximum Temperature	Minimum Temperature
Annual	Average (mm)	31.4	17.4
	Range - Average (mm)	30.9 - 31.9	17 - 17.8
Winter (JF)	Average (mm)	21.9	7.3
	Range - Average (mm)	21.5 - 22.5	6.9 - 7.6
Pre Monsoon (MAM)	Average (mm)	35.1	19.0
	Range - Average (mm)	34.5 - 35.8	18.5 - 19.6
Monsoon (JJAS)	Average (mm)	35.8	25.4
	Range - Average (mm)	35.4 - 36.2	25.2 - 25.7
Post Monsoon (OND)	Average (mm)	28.2	11.9
	Range - Average (mm)	27.7 - 28.7	11.3 - 12.5
Annual	Range- Inter-annual variation	0.02 - 0.02	0.03 - 0.03
Winter (JF)	Range- Inter-annual variation	0.04 - 0.04	0.13 - 0.14
Pre Monsoon (MAM)	Range- Inter-annual variation	0.03 - 0.04	0.04 - 0.04
Monsoon (JJAS)	Range- Inter-annual variation	0.02 - 0.03	0.02 - 0.02
Post Monsoon (OND)	Range- Inter-annual variation	0.04 - 0.04	0.06 - 0.07

Diurnal temperature varies from 31.4°C to 17.4°C. There is no significant trend in the mean maximum temperature. Minimum temperature shows an increase of about 1.0°C to 1.2°C in 37 years. Spatial variation in annual maximum and minimum temperature found to be around 2°C. **Figure 3** depicts spatial variation in the long term statistics for mean maximum and minimum temperatures.

4.3 Seismic Hazard

All districts of Haryana sub-region lie in Zone IV and High damage risk zone (MSK VIII) in respect to earthquakes. The earthquake database is available only for the earthquakes that taken place after the historical period i.e. 1800 A.D.

Figure 3: Observed Mean Maximum and Minimum Temperature in Haryana

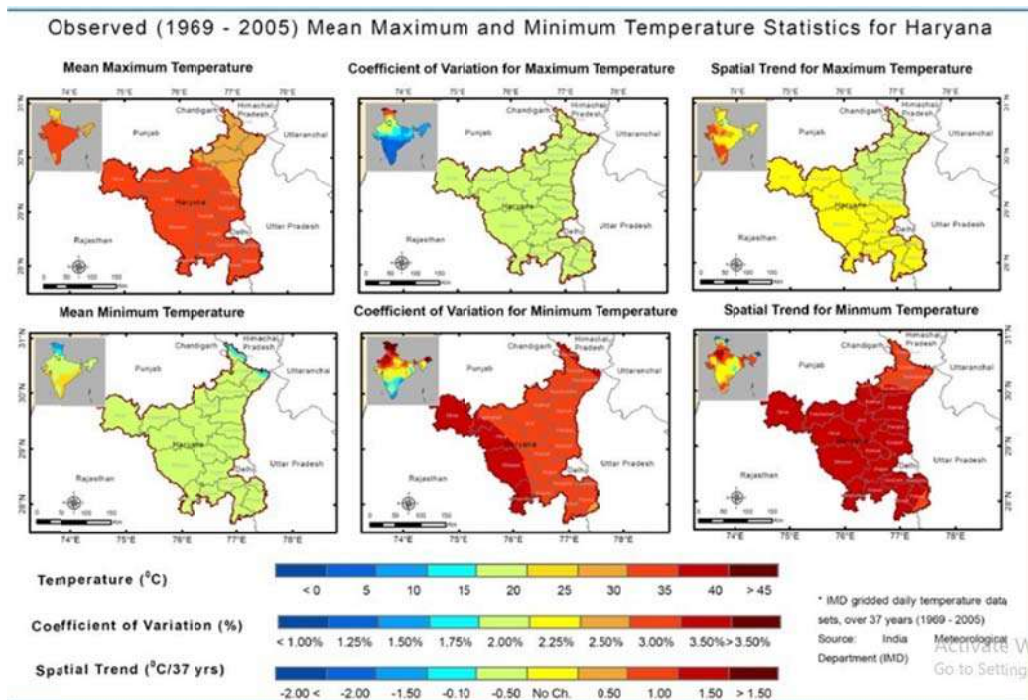


Table 3: Earthquakes Felt In The Haryana Sub-Region And Surroundings

Date	Place	Intensity	Northing	Easting	Depth	Origin Time
27 Aug1960	Gurgaon-Faridabad	6.0	28.20	77.40		15:58:59.20
20 June 1966	Delhi-Gurgaon Border	Mb 4.7	28.50	76.98	053.0 kms	13:42:57
29 July 1980	Western Nepal	Mw 6.8	29.60	81.09		14:58:40
21 Oct 1991	Near Piliang (Uttarkashi), Uttaranchal	Mw 6.8	30.78	78.77		21:23:14
12 Nov 1996	Near Kurukshetra (Haryana-U.P. bdr. region)	Mb 4.5	29.928	77.207	055.0 kms	04:20:58
4 May 1997	Rothak-Sonipat Districts (Haryana)	ML 4.1	28.984	76.588	28.8 kms	07:19:22
30 Mar 1998	Mahendragarh-Bhiwani Districts (Haryana-Rajasthan Border.)	Mb 5.0	28.211	76.240	010.0 kms	23:55:45
22 Mar1999	North of New Delhi. (Haryana-Uttar Pradesh Border region),	Mb 4.1	29.257	76.940	207.6 kms	09:56:16
29 Mar 1999	Near Gopeshwar (Chamoli), Uttaranchal	Mw 6.5	30.492	79.288		19:05:11
28 April 2001	Sonipat-Delhi region	Mb 4.3	28.591	77.044	15.4 kms	03:06:27
22 Dec 2003	Jind region, Haryana	ML 3.5	29.235	76.401	15.4 kms	20:19:08
27 Nov 2004	Chandigarh-north Haryana region	ML 3.9	30.352	77.129	19 kms	23:53:54
8 Oct 2005	Kashmir-Kohistan, Pakistan-India border	Mw 7.6	34.432	73.537	020.0 kms	03:50:40
25 Nov 2007	Delhi metropolitan area	Mb 4.6	28.677	77.204	10 kms	23:12:17

Source: NDMA & RDMD, Haryana

4.4 Flood Hazard & Disaster

Among the major disasters that occur in the sub-region, floods due to river are the most hazardous as they cause heavy damage to agricultural crops. The cause of flood is attributed to peculiarities of the rainfall in the state. The geomorphic setting of the state comprising of Himalayan topographic high in the north and Aravali mountain in the south resulted in the development of a saucer type of topographic depression in the central part of the state. The floods occur mainly due to heavy runoff in the mountainous terrain and over flow in river Yamuna in the plains during monsoon season. The active and old flood plain areas in Sub Region are located in parts of Panipat, Sonipat and Faridabad.

There are number of instances when several districts faced flood hazard primarily due to heavy rain in monsoon and discharge in Yamuna. Flood history of Haryana sub-region from 1978-2010, reveals that whenever heavy rainfall has taken place, it has resulted in flooding of district of Rohtak, Sonipat, Gurgaon & Faridabad. Sonipat & Faridabad are located on the river Yamuna & the flow of Yamuna depends on the rainfall in its catchment, including Himalayas, while the districts of Rohtak & Gurgaon are primarily flooded due to poor surface drainage facilities.

Major flood areas where disaster in the past was experienced were in Faridabad, Palwal and Panipat district. The gauge level of the Yamuna had risen up to 205-207 mm. The floods in the district of Faridabad, Palwal and Panipat are mainly due to heavy rains and over flow of River Yamuna. The districts of Faridabad, Palwal consist of hillocks, valleys and undulated terrain. Over flowing of some local streams due to rain also increases the quantum of floods. The floods in Yamuna River are caused due to excessive discharge of water from Tajewala head.

Figure 4: Earthquake Hazard Map of Haryana

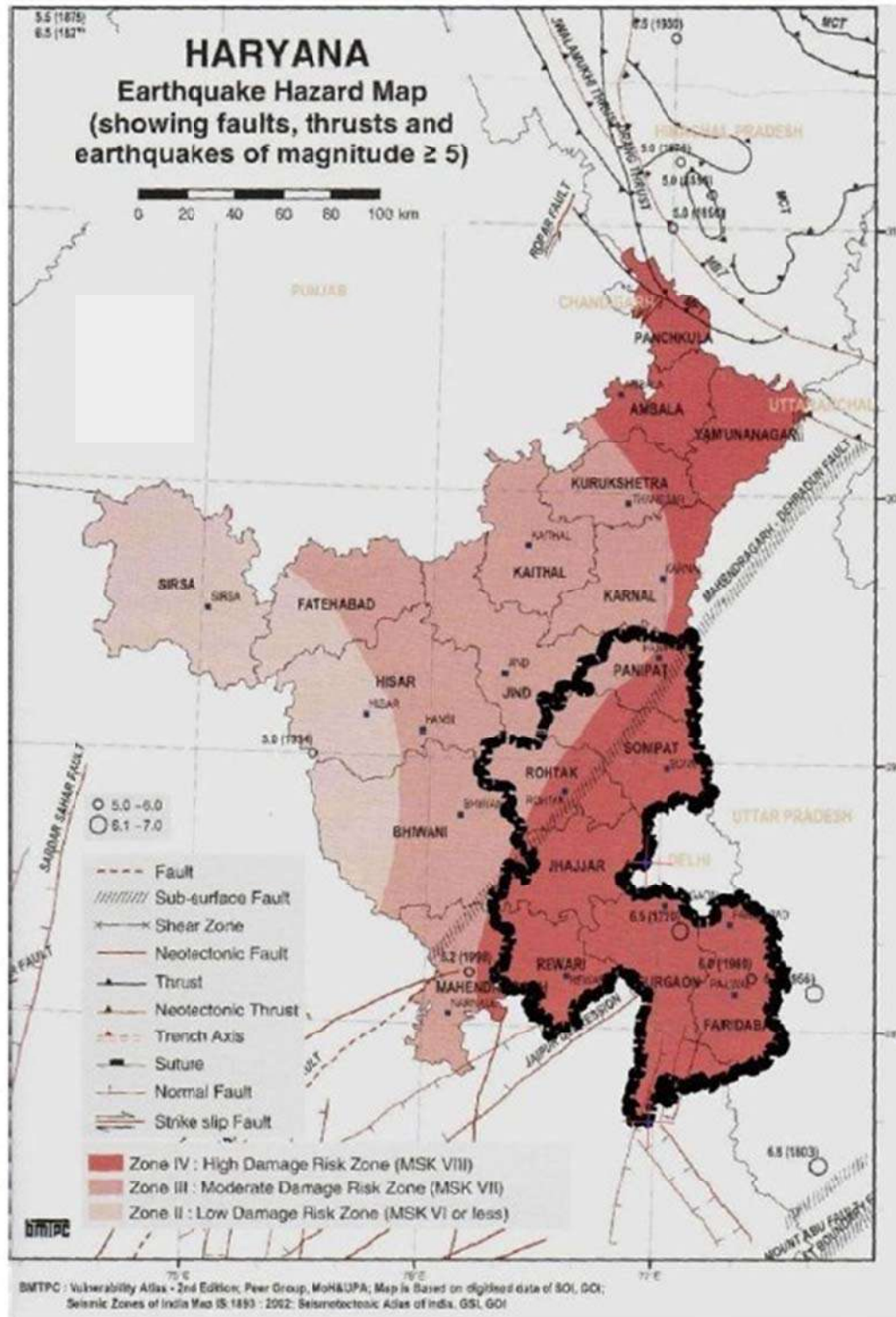


Table 4: Major Known Flood Disasters Which Have Taken Place in The Sub-Region

Duration/Year	District Affected with in Sub-Region	Primary cause/Remarks
1978	Sonipat, Faridabad and adjoining areas of Delhi	Heavy rainfall and discharge in Yamuna
1983	Rohtak, Sonipat, Gurgaon, Faridabad	Intensive rainfall
22-26 th September, 1988	Faridabad, Sonipat	Heavy rainfall and discharge in Yamuna
5-15 September, 1995	Haryana	Heavy rainfall and discharge in Yamuna
June, 1996	Gurgaon, Mewat, Rewari, Faridabad	Intensive rainfall
16-20 th October, 1998	Sonipat, Rohtak, Jhajjar	Intensive rainfall
5-8 th August, 2008	Rohtak, Jhajjar, Sonipat	Intensive rainfall

Source: Irrigation Department, Haryana

4.5 Project Flood Vulnerability and Mitigation Measures

The project alignment runs almost parallel to KMP (Kundli-Manesar-Palwal) expressway. In the existing KMP expressway, openings are provided to cater to the flood discharge at the highest flood events.

Figure 5 shows Flood Vulnerability Index of HORC alignment as per National Flood Vulnerability Assessment System (FVAS). As per FVAS, flood vulnerability of HORC alignment is shown in **Table 5**.

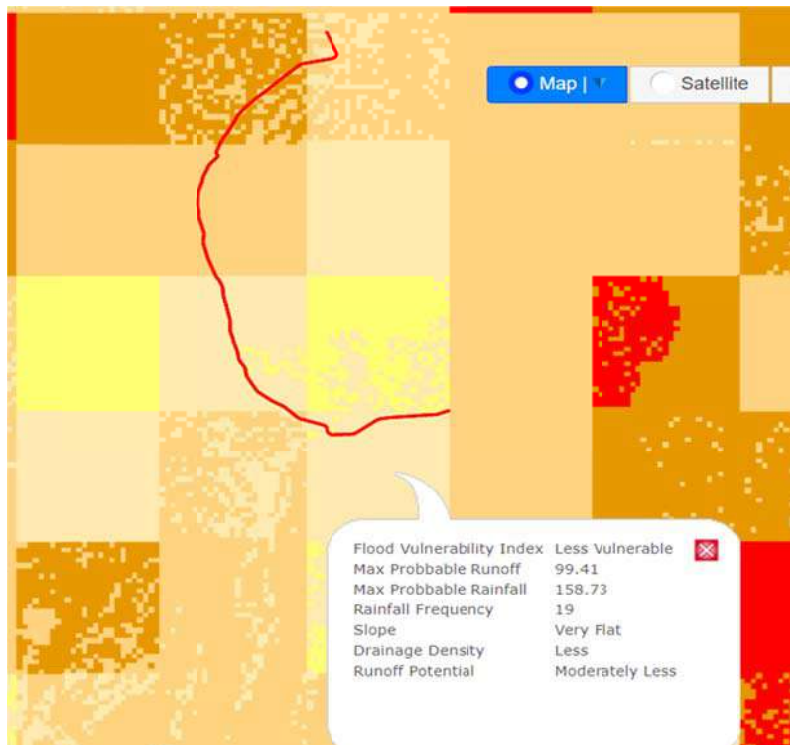
For the HORC project, Hydrological investigations were carried out with the topographical survey during DPR stage to understand the flood scenario at the proposed alignment. The high flood levels and cross section data were estimated through local enquiry and survey. Span arrangements for crossings are proposed so as to cater to the flood discharge at highest flood events. The primary objective was to determine the size of opening required to discharge the design flood across the embankment safely. The High Flood Levels at the bridges and culverts are used to arrive at the formation level at the alignment so that the infrastructure is safe against all floods up to the design flood. Waterway bridges are provided in the HORC alignment for preventing flooding. The details of such water ways are given in following **Table 6**.

Table 5: Flood Vulnerability Index of HORC alignment

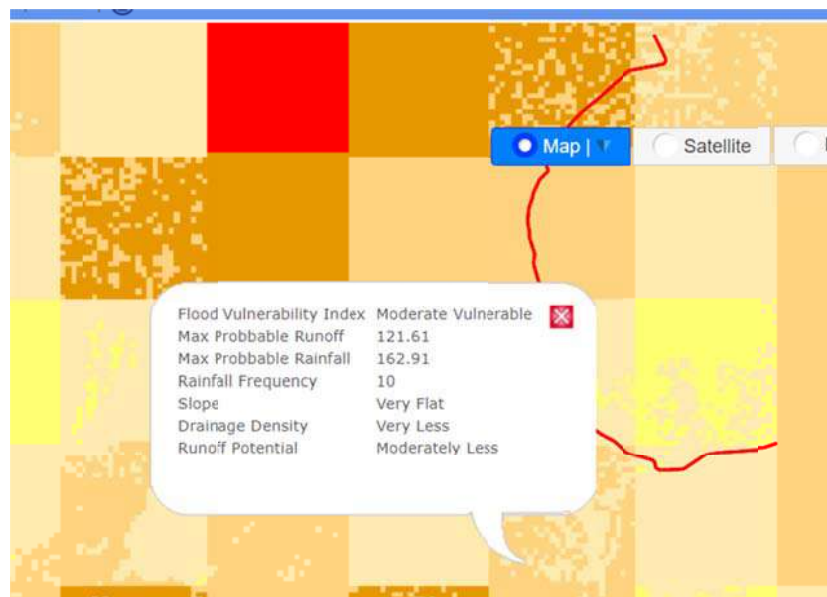
S. No.	Change		Max. Probable Runoff	Max Probable Rainfall	Rainfall frequency	Slope	Drainage Density	Run-off Potential	Flood Vulnerability
	From	To							
1.	Start	26.000	99.11	158.73	19	Very flat	Less	Moderately less	Less Vulnerable
2.	26.000	30.000	121.61	162.91	10	Very flat	Very less	Moderately less	Moderately Vulnerable
3.	30.000	73.000	61.57	130.33	10	Very flat	Very less	High	Less Vulnerable
4.	73.000	91.000	149.54	220.06	16	Very flat	Very less	Moderately high	Moderately Vulnerable
5.	91.000	114.000	235.42	236.51	18	Very flat	Very less	High	High Vulnerable
6.	114.000	End	116.96	191.4	35	Flat	Very less	High	Less Vulnerable

Figure 5: Flood Vulnerability Index of HORC Alignment as Per National Flood Vulnerability Assessment System (India Geo -Platform of ISRO)

Start to 26.000 km



26.000 km to 30.00 km



30.000 km to 73.000 km



73.000 km to 91.000 km



91.000 km to 114.000 km



Km 114.000 to End



Table 6: Details of Bridges (Excluding Road Crossings)

Sl. No	Chainage	TYPE OF CROSSING
1	-2515	Canal
2	-1476.983	Drain
3	-1280	Balancing culvert
4	-320	Canal
5	1757.5	Canal
6	2471.289	Balancing culvert
7	4210	Balancing culvert
8	5733.088	Balancing culvert
9	7259.933	Balancing culvert
10	7342.759	Canal
11	7459.962	Balancing culvert
12	7641.888	Drain
13	7912	Field Channel
14	8210.132	Balancing culvert
15	8867.78	Balancing culvert
16	9175	Balancing culvert
17	9409.741	Balancing culvert
18	10222	Balancing culvert
19	10660.555	Balancing culvert
20	10751.57	Balancing culvert
21	11525.363	Balancing culvert
22	11615.818	Drain
23	11658.915	Balancing culvert
24	12125	Balancing culvert
25	12431.74	Balancing culvert
26	13323	Branch Canal
27	13495	Branch Canal
28	13787	Stream
29	14416	Balancing culvert
30	14712	Field Channel
31	27620	Stream
32	28360	Stream
33	28900	Stream
34	29860	Canal

Sl. No	Chainage	TYPE OF CROSSING
35	30176	Drain (Nala)
36	30084.66	Balancing Culvert
37	34989.27	Balancing Culvert
38	37174	Balancing Culvert
39	38482	Balancing Culvert
40	38701	Balancing Culvert
41	39060	Balancing Culvert
42	41056	Stream
43	41100	Balancing Culvert
44	41217	Balancing Culvert
45	43732	Balancing Culvert
46	44050	Balancing Culvert
47	44317	Balancing Culvert
48	44641	Balancing Culvert
49	44910	Balancing Culvert
50	45411	Balancing Culvert
51	46400	Balancing Culvert
52	47650	Balancing Culvert
53	52934	Balancing Culvert
54	53282	Balancing Culvert
55	53572	Balancing Culvert
56	54363	Balancing Culvert
57	54804	Balancing Culvert
58	55382	Balancing Culvert
59	56403	Balancing Culvert
60	57980	Balancing Culvert
61	58191	Balancing Culvert
62	59071	Balancing Culvert
63	59270	Balancing Culvert
64	59501	Balancing Culvert
65	60033	Balancing Culvert
66	61010	Balancing Culvert
67	62203	Balancing Culvert
68	62446	Balancing Culvert
69	63295	Balancing Culvert
70	63537	Balancing culvert
71	64002	Canal
72	64147.793	Balancing culvert
73	64200	Balancing culvert
74	64740	Balancing culvert

Sl. No	Chainage	TYPE OF CROSSING
75	65265.798	Balancing culvert
76	65619.792	Balancing culvert
77	65927	Canal
78	66642.668	Canal
79	67209.281	Balancing culvert
80	67709.284	Balancing culvert
81	67942.286	Balancing culvert
82	68577.288	Balancing culvert
83	69209.292	Balancing culvert
84	69593.891	Balancing culvert
85	70068	Balancing culvert
86	70612.838	Balancing culvert
87	70883.134	Balancing culvert
88	71020	Balancing culvert
89	71440	Canal
90	72885	Canal
91	73960	Field channel
92	74100	Field Channel
93	74373.467	Canal
94	74451.273	Canal
95	74928.783	Field Channel
96	75211.492	Field Channel
97	75470.341	Balancing culvert
98	75810.135	Balancing culvert
99	75886.256	Canal
100	76120.218	Balancing culvert
101	76523.597	Balancing culvert
102	77103.662	Balancing culvert
103	77480	Balancing culvert
104	77770.686	Balancing culvert
105	78351.231	Balancing culvert
106	78669.052	Balancing culvert
107	79005.058	Balancing culvert
108	79274.06	Balancing culvert
109	79400	Balancing culvert
110	79881.007	Canal
111	80048	Field Channel
112	80125	Field Channel
113	80487.086	Field Channel
114	80613.16	Field Channel
115	80797.831	Field Channel
116	81201.855	Field Channel
117	81739.713	Field Channel

Sl. No	Chainage	TYPE OF CROSSING
118	82100	Balancing Culvert
119	82682.864	Canal
120	82984.517	Field Channel
121	84458.005	Field Channel
122	84949.46	Field Channel
123	85559.397	Balancing Culvert
124	85946.079	Field Channel
125	86239.222	Canal
126	87300	Balancing Culvert
127	87420	Canal
128	89437.067	Field Channel
	90054.745	Field Channel
130	90171.524	Canal
131	91267.926	Field Channel
132	91612	Field Channel
133	91878.411	Canal
134	92114.454	Field Channel
135	92638.665	Field Channel
136	93038.783	Field Channel
137	93525.911	Canal
138	94240	Field Channel
139	94843.601	Field Channel
140	95246.462	Field Channel
141	95805.852	Field Channel
142	95900	Field Channel
143	96569.228	Field Channel
144	96730	Canal
145	96880	Canal
146	97986.951	Field Channel
147	98240	Field Channel
148	98532.052	Field Channel
149	98956.033	Field Channel
150	99144.71	Field Channel
151	99515	Field Channel
152	99711	Canal
153	100027.979	Balancing Culvert
154	100433.691	Balancing Culvert
155	101332.718	Balancing Culvert
156	101623.837	Balancing Culvert
157	101978.607	Balancing Culvert
158	102135.782	Balancing Culvert
159	102458.426	Field channel
160	102711.165	Balancing Culvert
161	102920	Balancing Culvert

Sl. No	Chainage	TYPE OF CROSSING
162	103215	Balancing Culvert
163	103460	Balancing Culvert
164	104020	Balancing Culvert
165	104180	Balancing Culvert
166	104420	Balancing Culvert
167	104660	Balancing Culvert
168	105820	Balancing Culvert
169	106200	Canal
170	106420	Balancing Culvert
171	106680	Balancing Culvert
172	107380	Balancing Culvert
173	107800	Balancing Culvert
174	108700	Balancing Culvert
175	108880	Balancing Culvert
176	109363	Canal
177	110220	Field Channel
178	110529.725	Canal
179	110720	Balancing Culvert
180	111020	Balancing Culvert
181	111520	Balancing Culvert
182	112200	Balancing Culvert
183	112480	Balancing Culvert
184	112720	Balancing Culvert
185	113160	Field Channel
186	113680	Field Channel
187	114220	Field Channel
188	114990	Field Channel
189	115630	Canal
190	116960	Field Channel
191	117240	Field Channel
192	118280	Balancing Culvert
193	118960	Balancing Culvert
194	120140	Stream
195	120255	Canal
196	122240	Balancing Culvert
197	122940	Balancing Culvert
198	123240	Canal
199	124460	Canal

Table 6A: Details of Major Bridges (Waterway Crossings)

S.NO.	CHAINAGE	TYPE OF BRIDGE	SPAN
1	7339.9	Open Web Girder	1x61.00
2	66642.668	Open Web Girder	2x30.5
3	71356.34	Open Web Girder	1x76.2+1x45.7+1x76.2
4	79881.007	Composite	1x30.5
5	86340	Composite	1x30.5
6	90171.524	Open Web Girder	1x61+1x45.7
7	93525.911	Open Web Girder	1x45.7
8	96730	Composite + PSC U Slab	1x12.2+2x30.5+1x12.2
9	115630	Open Web Girder	2x61
10	120255	Composite	2x30.5

5.0 Climate Risk and Adaptation Assessment Level

Long term climate change risks that could impact projects are flooding from extreme rainfall events, particularly during monsoon periods, and increases in annual average temperature in the project area that could increase the risk of extreme hot days. Heat waves and flooding appear as priority threats.

Generic impacts of climate change on rail infrastructures/assets as identified in numerous literatures are briefly outlined here. These impacts call for careful consideration of rail design, construction, and maintenance to achieve lasting benefits.

- Rise in air temperature and temperature extremes can accelerate buckling of rail tracks. Under direct sunlight, tracks can get as high as 20°C hotter than the ambient air hence this causes metal to expand, putting it at risk of misalignment and deformations that are introduced in rail when the weight of train cars put stress in areas that are weakened by exposure to excessive heat
- Rise in air temperature and temperature extremes can cause overhead electrical lines to expand and sag in heat with the danger of touching the tops of train carriages
- Rise in temperature extremes impacts on concrete construction practices, including thermal expansion affecting rail bridge expansion joints
- Changes in rainfall, temperature, and evaporation patterns can alter the moisture balances in rail track bed foundations and formations
- Rise in the water table can lead to the reduction of the structural strength of the formations, leading to damages to earthworks, embankments, and drainage systems
- Precipitation increase and increase in intense precipitation events can cause overloading of drainage systems, causing backups, flooding, and track formation washouts
- Changes in seasonal precipitation and river flow patterns induce increased risk of floods from runoff, landslides, slope failures, and damage to rail track formation and bridges
- Storms can bring about increased flooding, greater probability of infrastructure failures, erosion of rail track foundation and bridge supports, bridge scour, reduced clearance under bridges, wind damage to roofs of stations, lighting, overhead cables, rail signals, and other tall structures, uprooting of trees etc.

Adaptation may involve additional investments on design and materials, use/installation of new technologies, and improved operation and maintenance.

6.0 Climate Change Adaptation Measures Incorporated in the DPR

- I. For rail tracks, the HRIDC has proposed the use of 60 Kg (T-12) - Prime quality steel rails, a product of recent advances in special heat treatment of steel that achieves an increase in hardness by nearly 50% in comparison with standard steel grades.
- II. To facilitate percolation of runoff into the ground, to conserve and augment the storage of ground water, it has been proposed to construct roof top rainwater harvesting structure of suitable capacity at stations as mentioned in "Manual on Artificial Recharge of Ground Water" issued by Central Ground Water Board.
- III. For flood mitigation all bridges will have drop walls and curtain walls which is a standard design practice of RDSO. So, no additional cost is considered.
- IV. For prevention of local flooding, side drains are proposed in the segments where the railway formation is in cuttings as per Indian Railways Permanent Way Manual (IRPWM), 2019.
- V. For earthquake hazard, the design has been adopted to Indian Zone IV seismicity as applicable to Haryana. So no additional cost is required for earthquake hazard.
- VI. The alignment of HARC is planned with 5m or more height above the natural ground to eliminate any level crossings for road alignments across HARC. Further, no major river is crossing the HARC alignment. Nearest river Yamuna is far away from HARC alignment which obviates the possibility of flooding on HARC due to Yamuna River. Further, 199 Bridges (including 7 Waterway, 112 Balancing Culverts and 80 Canal crossings) are provided on the existing water bodies/streams/canals to allow natural flow of water without obstruction. Also, it is pertinent to mention that HARC alignment runs parallel to existing Kundli -Manesar-Palwal (KMP) expressway in which openings are provided to allow passage of rainwater across the highway and accordingly, corresponding openings in the forms of bridges are provided in the HARC project.

Estimated adaptation cost of various adaptation activities are given in Table 7.

Table 7: Estimated Adaptation Cost

Target Climate Risk	Adaptation Activity	Estimated Adaptation Finance INR million)	Adaptation Finance Justification
Damage of steel rail due to extreme temperature	60 Kg (T-12) - Prime quality steel rails,	Nil	60 Kg is standard rail section adopted throughout all new constructions across Indian Railways under RDSO's specifications and same are

Target Climate Risk	Adaptation Activity	Estimated Adaptation Finance (INR million)	Adaptation Finance Justification
			mandatory to be applicable for HORC construction. ¹
Reduced availability of water construction and operation of railway line	Construction of rainwater structures at stations to facilitate percolation of runoff into the ground.	4.5	Inclusion of rainwater harvesting and recharge pits at stations buildings will entail additional civil works costs. ²
Increase of flooding	For flood mitigation all bridges will have drop walls and curtain .		This is standard design practice of RDSO for flood mitigation. So no additional cost is considered. ³
Increased precipitation resulting in flooding	Side drains for prevention of local flooding.	36	Side drains need to be arranged in the segments where the formation is in cutting and running through village areas. ⁴
Risk due to earthquake	For earthquake hazard, the design has been adopted as per Seismic Zone IV.	NIL	This is the standard design practice as per IS Codes and Indian railway code. So, no additional cost is required for earthquake hazard ⁵
Total		INR 40.5 million	

7.0 CLIMATE MITIGATION PLANS WITHIN THE PROJECT

Table 8: Mitigation Cost

Mitigation Activity	Quantity	Costs (INR million)	Costs (\$ million)	Mitigation finance justification
Construction of railway line – Average per annum GHG emission	61100 (tCO ₂ /year) (detailed computation and	393.2	5.25	Availability of a more efficient mode of public transport will cause the public to shift from more polluting road-based public and private transport

¹ The standard rail section is given in Indian railways permanent way manual, 2019

² The guidelines as mentioned in “Manual on Artificial Recharge of Ground Water” issued by Central Ground Water Board will be adopted for roof top rainwater harvesting

³ The standards for Curtain and Drop Walls are provided in Indian Railways Bridge Manual (IRBM) 1998

⁴ The standards for side drains are given in Indian Railways Permanent Way Manual (IRPWM), 2019

⁵ The standards for earthquake resistant design are given in IS1893:2002- Code for earthquake resistant design of structures

reductions (tCO2/year)	assumptions are in section 9)			resulting in reduced overall emissions.
Cost of providing Solar Panel at each station (One time)	-	7.5	0.1	10 kwp solar plant can generate about 1100 units a month. So about 50% energy will be renewable.

7.0 GREENHOUSE GAS EMISSIONS REDUCTION CALCULATION

Table 9: Green House Gas Saving

Year	Number of passenger shifted to HORC/IR	Freight estimates for Road to Rail Diverted traffic (in MMTPA)	Baseline Emissions		Project Emissions	Net Emission Savings (tCO2/year)
			Due to passenger Shift (tCO2/year)	Due to freight Shift (tCO2/year)	From passenger and freight transport (tCO2/year)	
2027	19159043	2.837	41868	19063	41749	19181
2032	22151129	4.221	48407	28363	49983	26785
2037	24291534	6.295	53084	42295	55928	39454
2042	26774041	9.406	58509	63202	62284	59426
2047	29662545	14.082	64821	94623	70509	88932
2052	33033183	21.121	72187	141917	81282	132822
Total			338876	389463	361735	
Average per Annum						61100

Note: Assumptions for CO2 Emission savings are given in Appendix -1

Appendix -1

ASSUMPTIONS FOR GREENHOUSE GAS SAVING CALCULATION

1. Source of emission reductions:

Carbon dioxide (CO₂) emission savings are based on the modal shift of passengers from buses, cars, and two-wheelers to the Haryana Orbit Rail Corridor (HORC) and freight shift from LCV, 2-Axle HCV and Multi-Axle HCV to HORC. As the operationalization of HORC will reduce congestion on existing Indian Railway network, Indian Railways will be able to run more passenger trains on existing routes. Therefore, reduction in Carbon dioxide (CO₂) emission due to shift of passengers from roads to IR network has also been accounted in these calculations. HORC emissions (those from electricity generated for the operation of the HORC) have been deducted from the CO₂ emission savings.

2. Upstream construction emissions rail.

This has not been included as the baseline (road) has comparable construction emissions plus the upstream emissions of vehicle production in the baseline is much higher than that of the rail carriages.

3. Modal shift

- The HORC will transport both passengers and freight.
- Modal shift for passenger is assumed as 44% from buses, 26% from two-wheelers, and 30% from cars.
- Modal shift from planes has not been considered as the distance is too short for air travel.
- The travel distance for modal shift of passenger is considered as 100 km for Bus, 20 Km for Two Wheelers and 50 km for Cars.
- Modal shift for freight is assumed as 29% from LCV & others, 25% from 2 Axle HCV and 46% from Multi Axle HCV.
- The average travel distance travelled by Freight on HORC is considered as 93 km

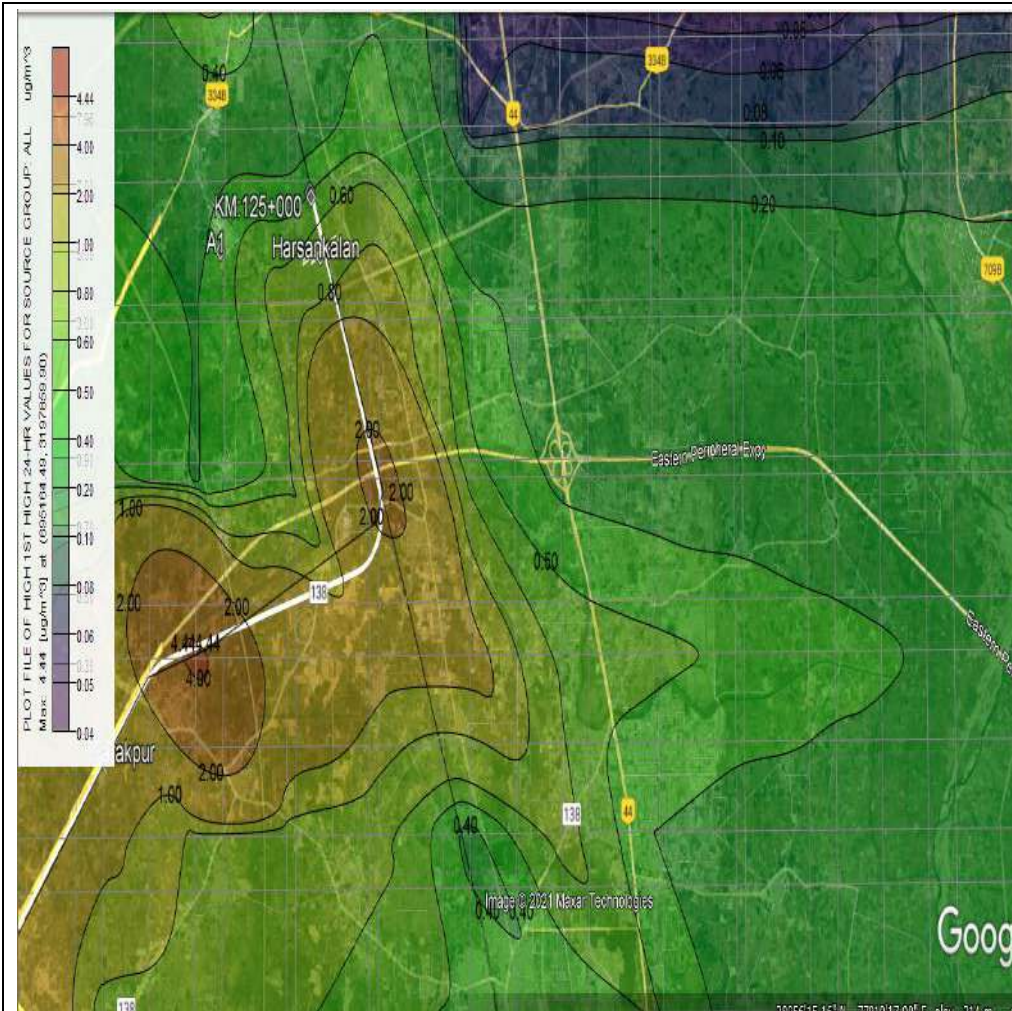
4. Emission factor (EF)

- For cars: 0.140 kg per kilometre (kg/km); Buses: 0.788 kg/km; and Two-Wheelers 0.029 kg/km – taken from Ministry of Housing and Urban Affairs guidelines
- For LCV & others: 0.401 kg per kilometre (kg/km); 2 Axle HCV: 0.602kg/km; and Multi Axle HCV 0.762 kg/km – taken from Draft report on “Emission Factor development for Indian Vehicles “ as a part of Ambient Air Quality Monitoring and Emission Source Apportionment Studies
- HORC EF taken from CO₂ Baseline Database for the Indian Power Sector, March 2021, Government of India Ministry of Power Central Electricity Authority

5. Electricity consumption

- Electricity (Kwh.) consumption per 1,000 GT. Kms.in year 2019-20 of Indian railway and multiplying it by GTKM

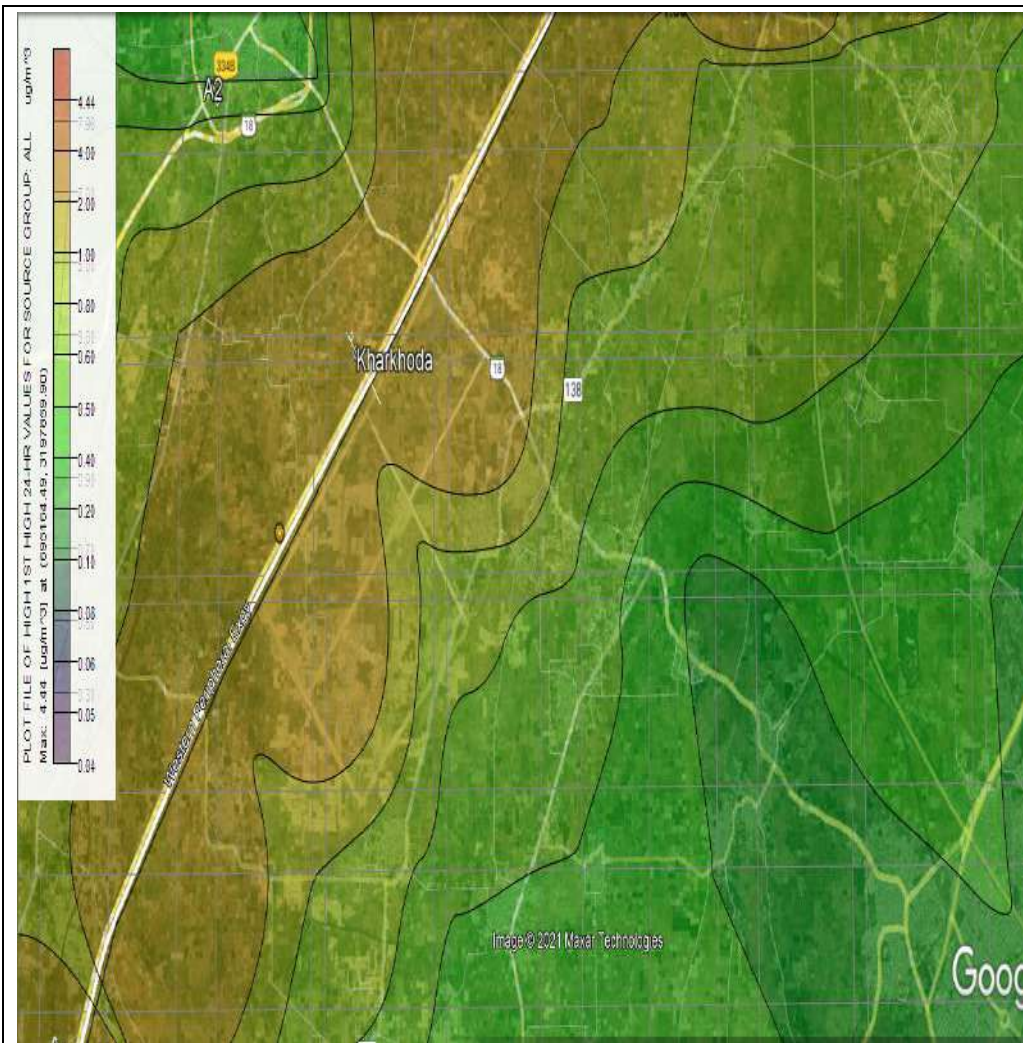
Annexure 5.2 (Station wise incremental Value for air Modelling)



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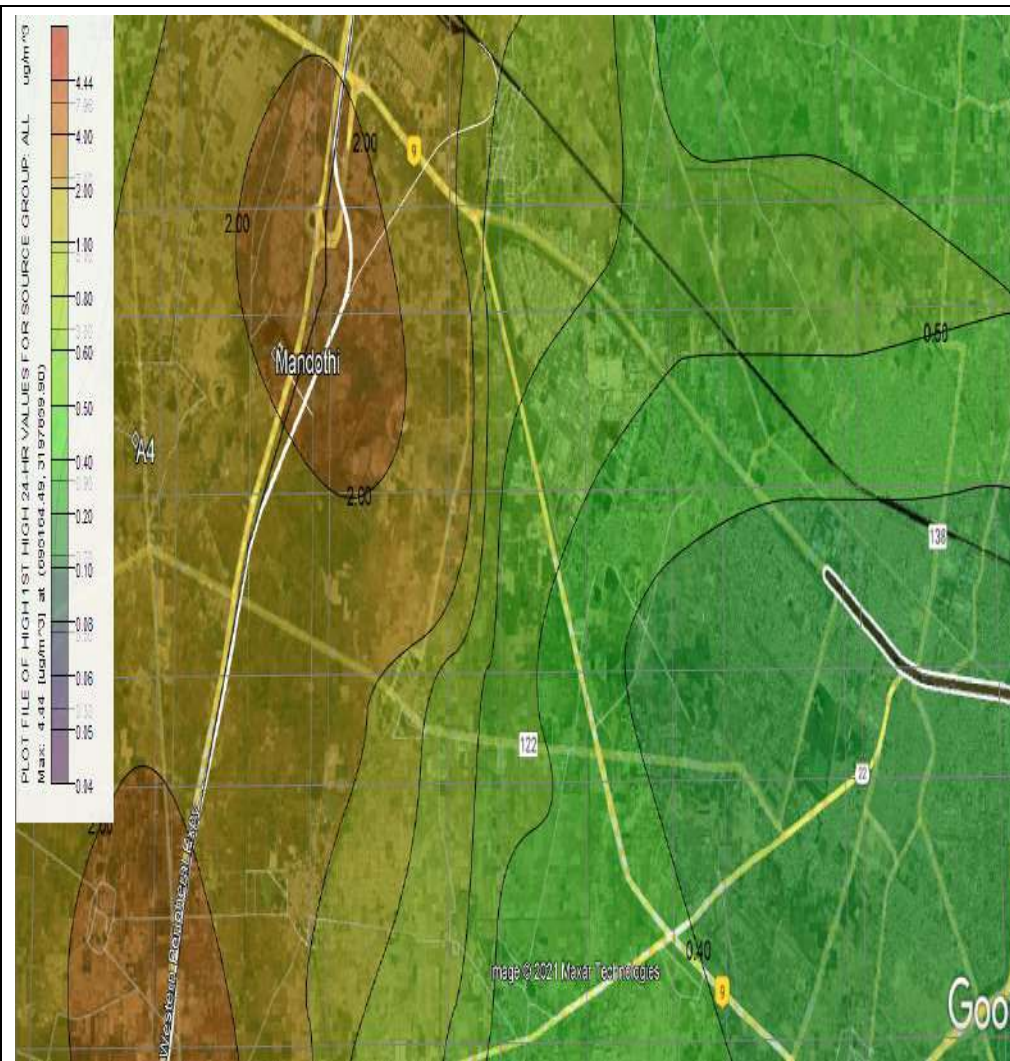
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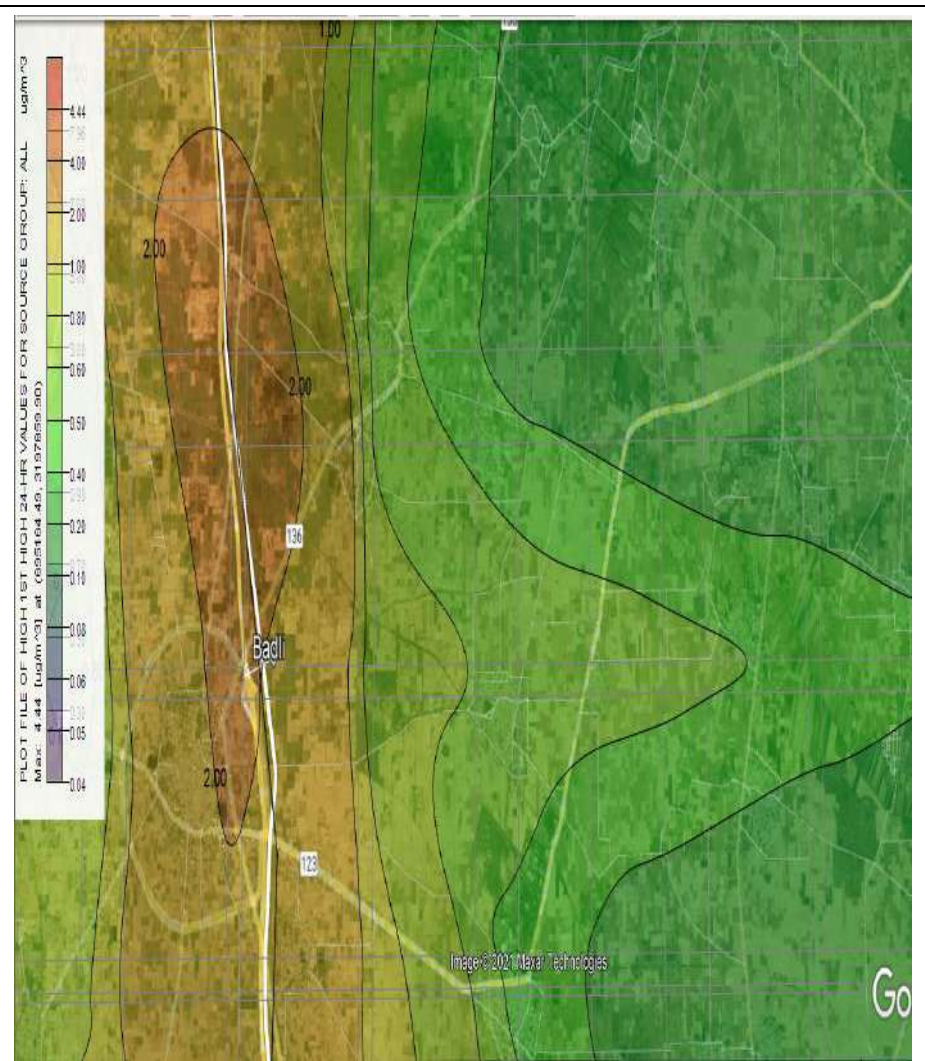
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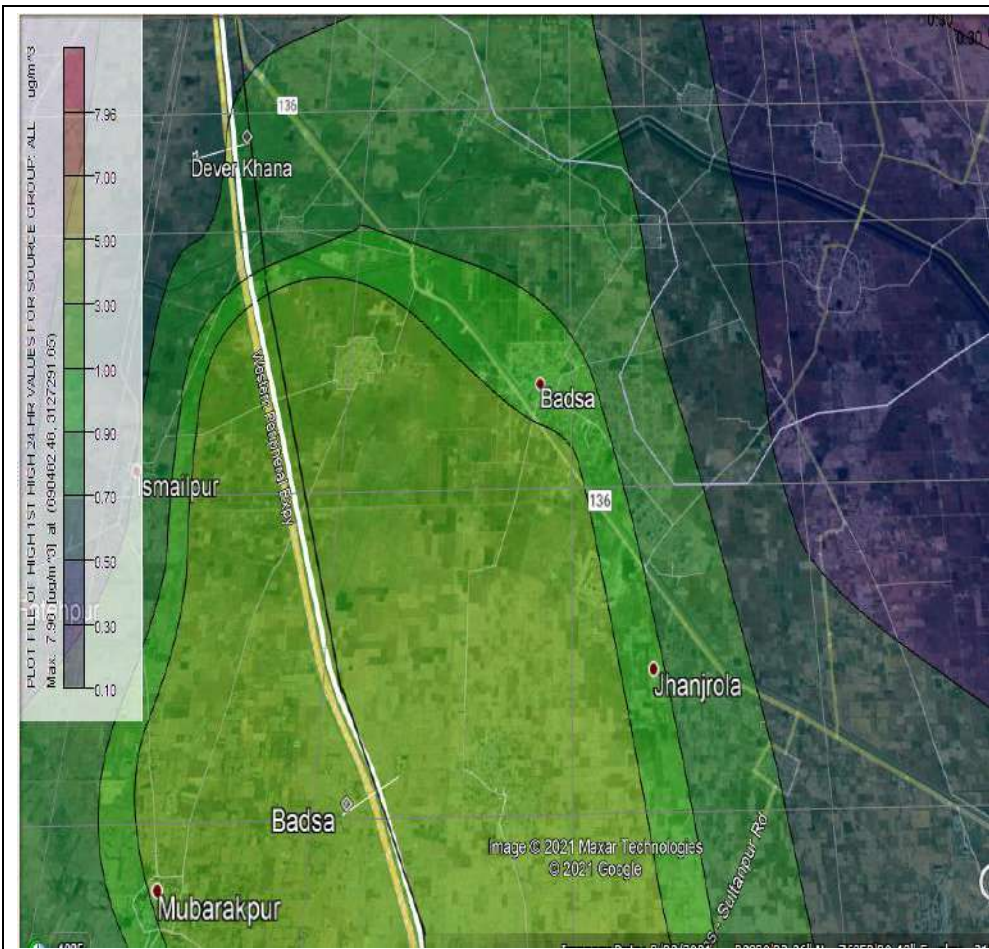
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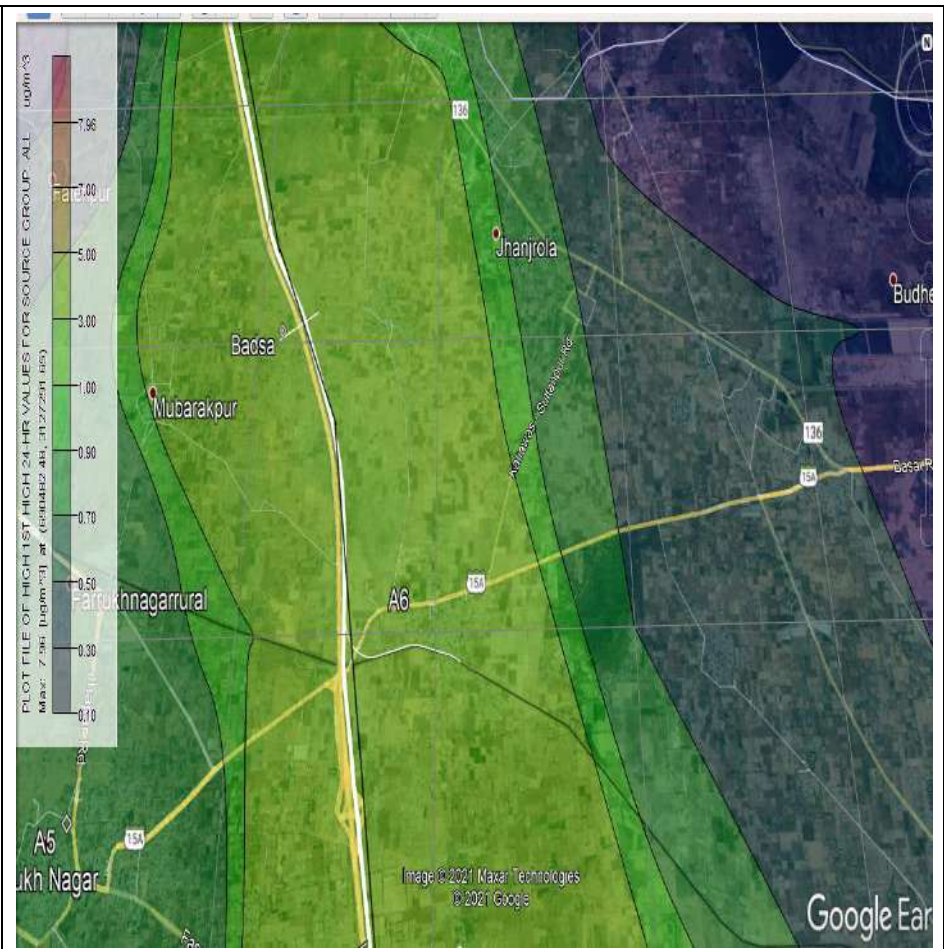
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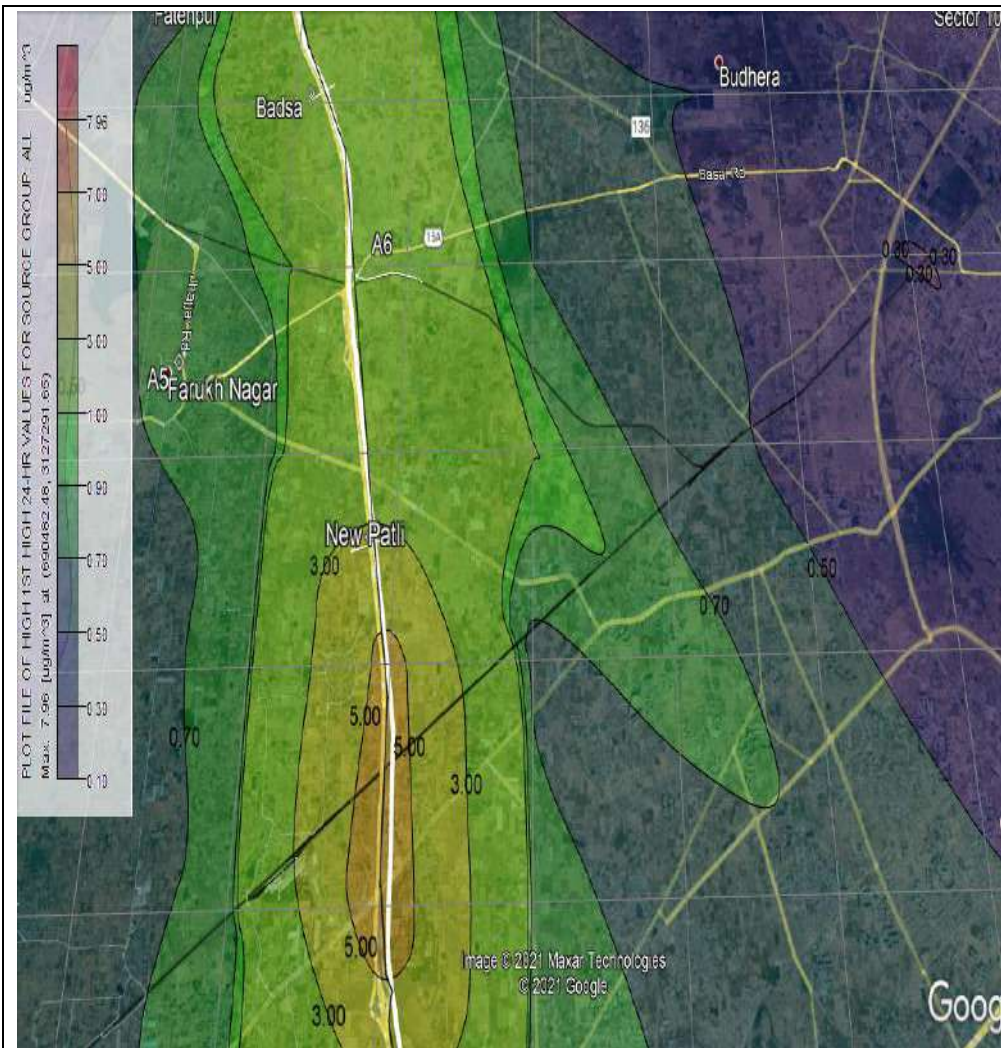
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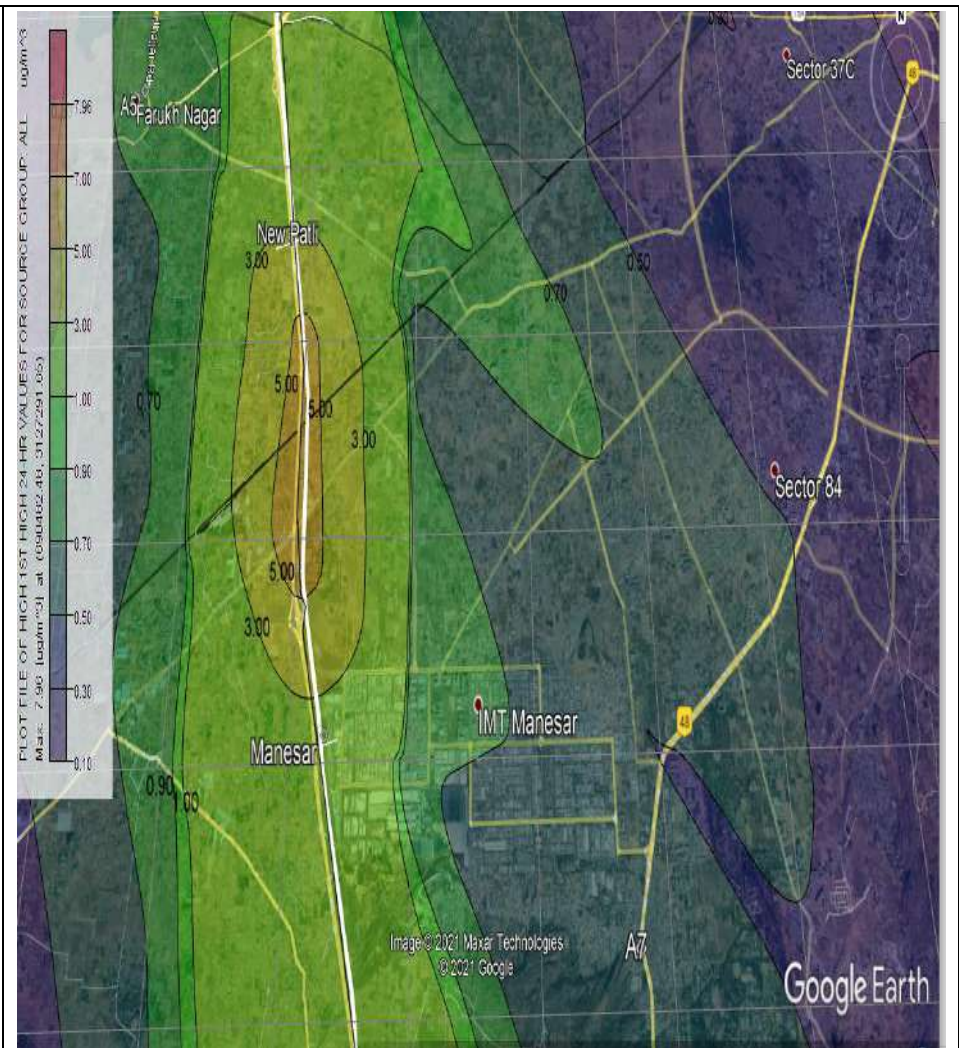
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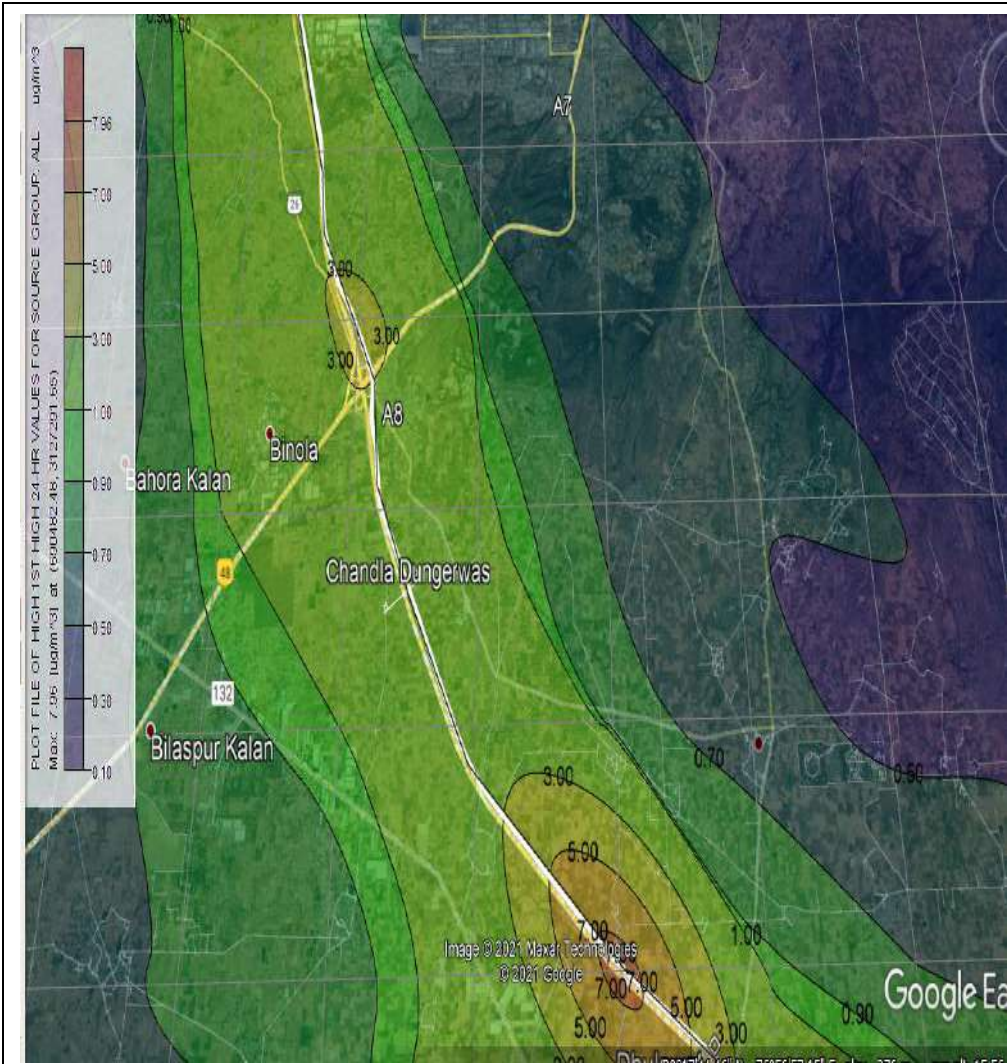
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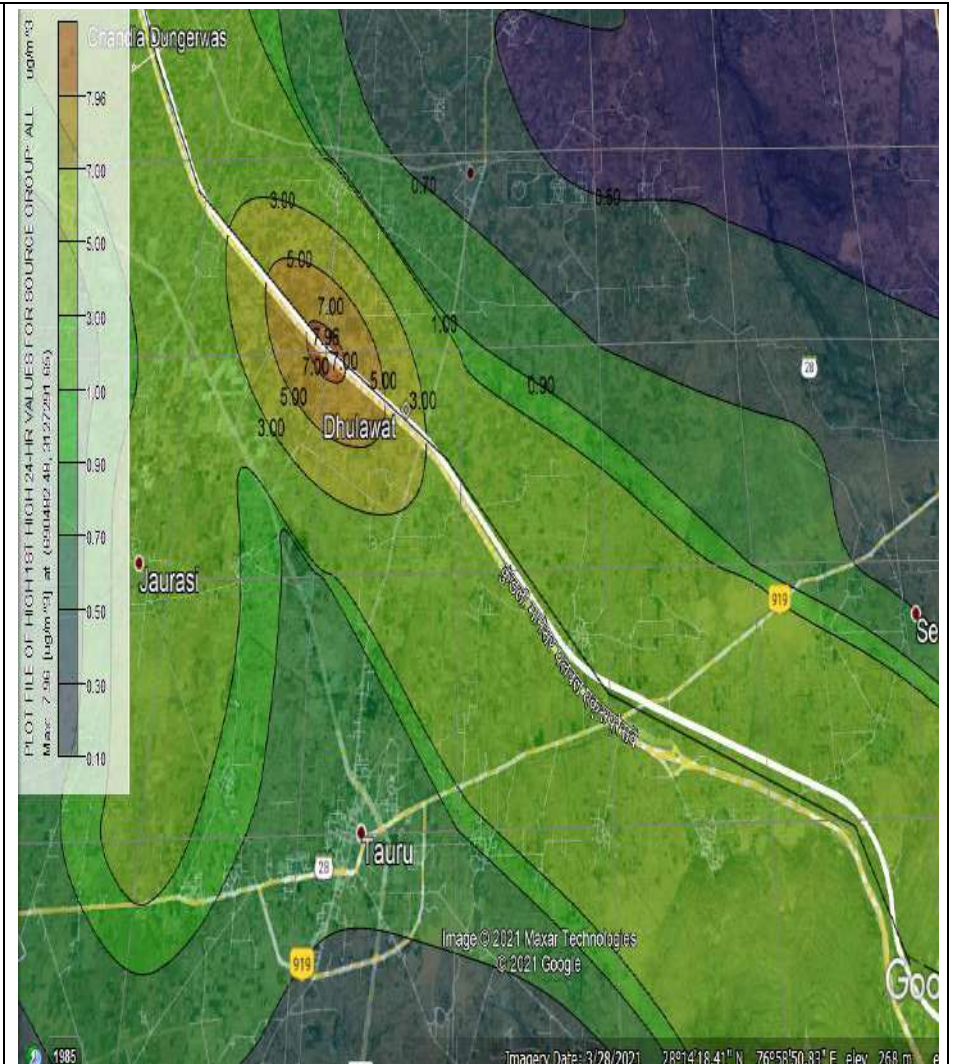
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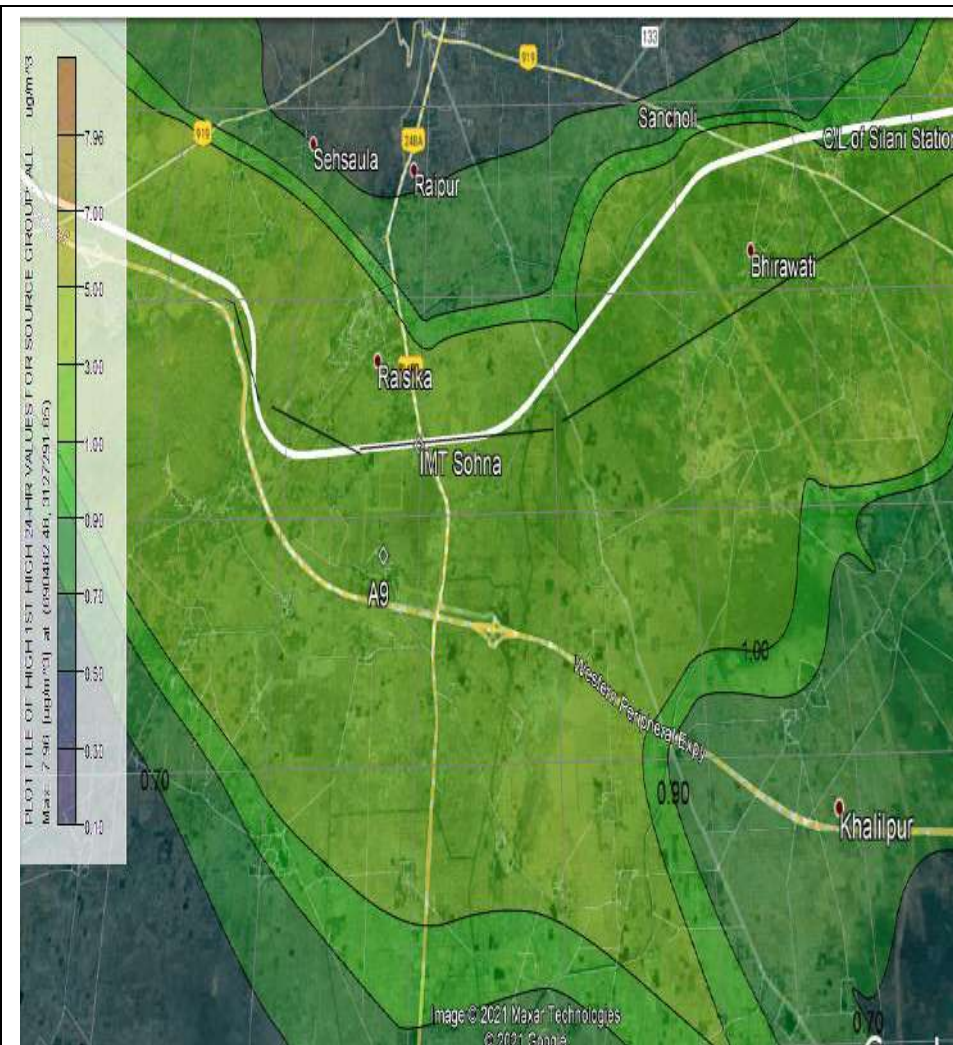
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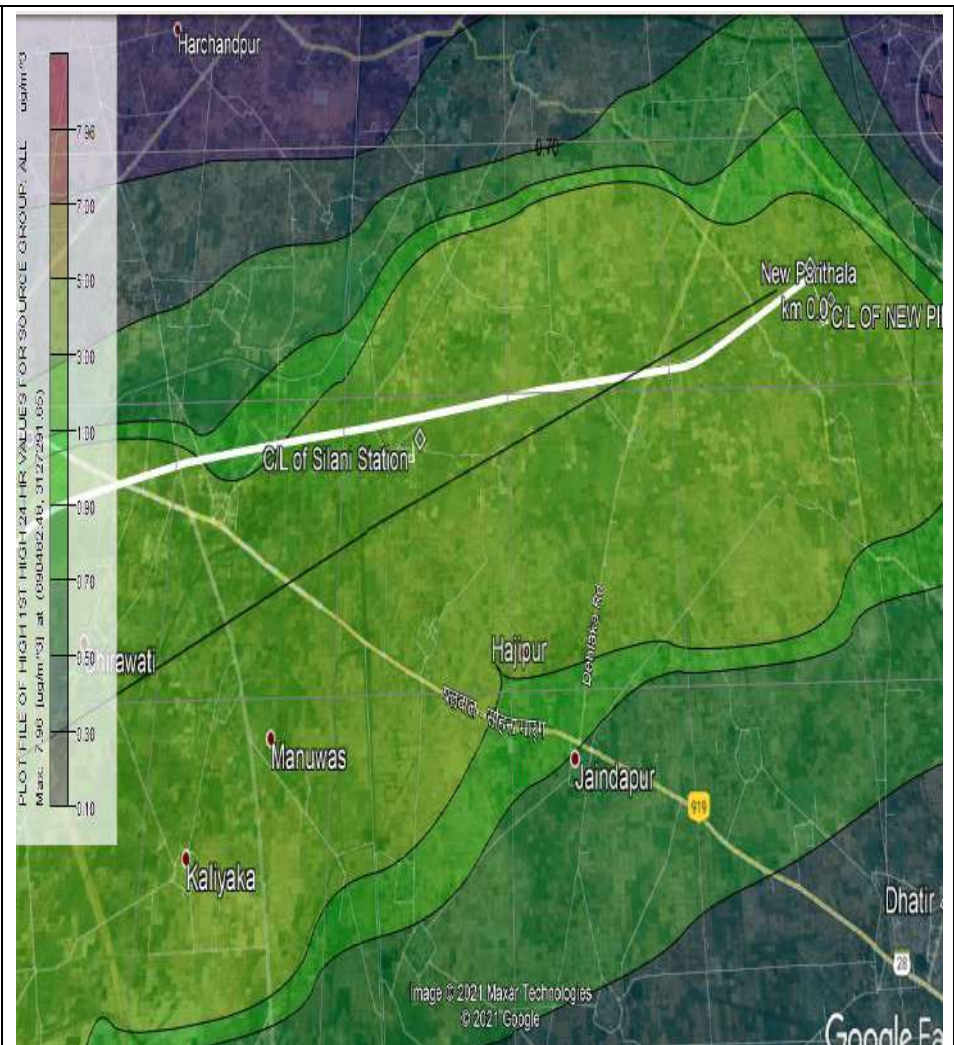
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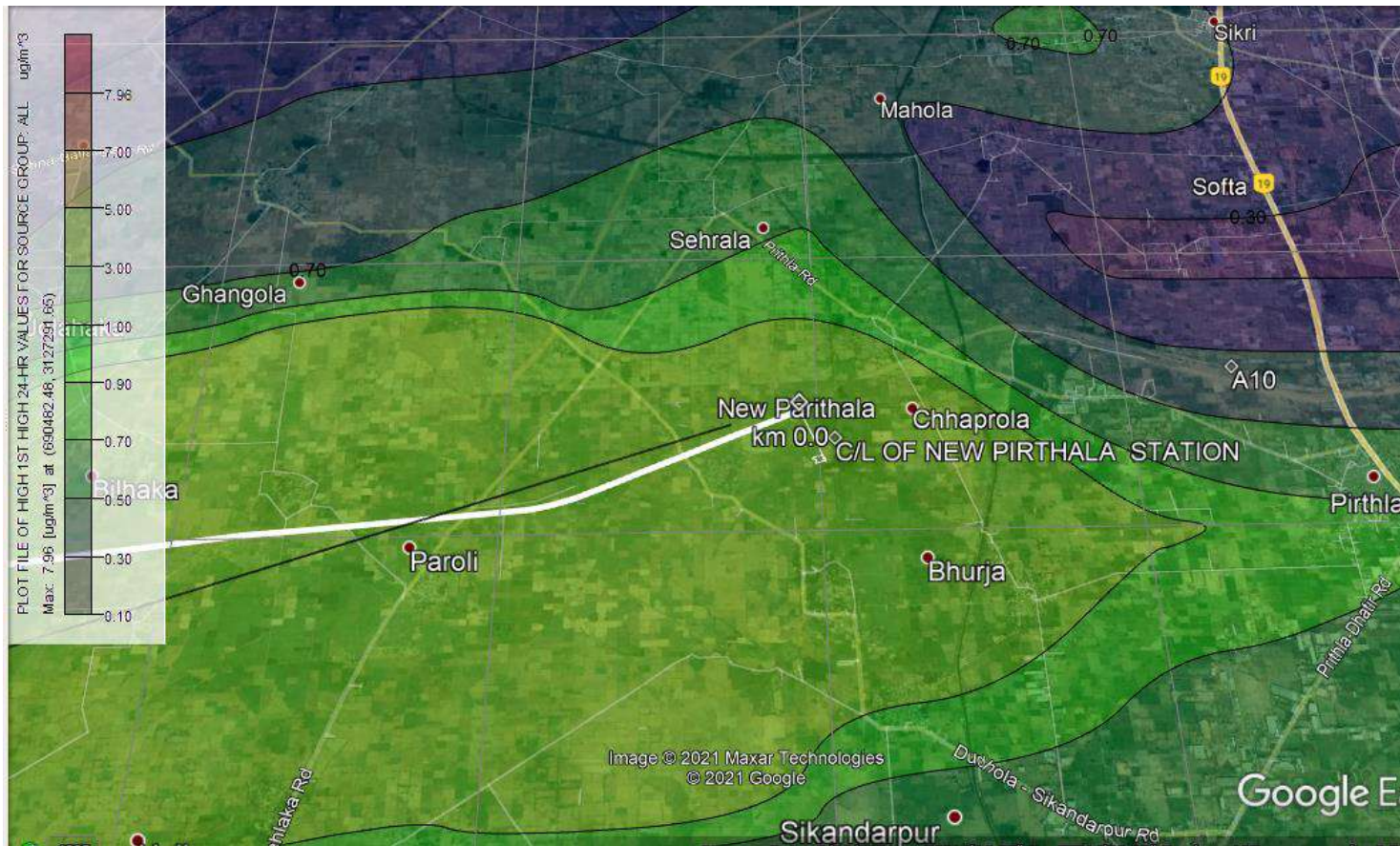
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PM_{2.5} INCREMENTAL GLC AT IMT SOHNA STATION LOCATION

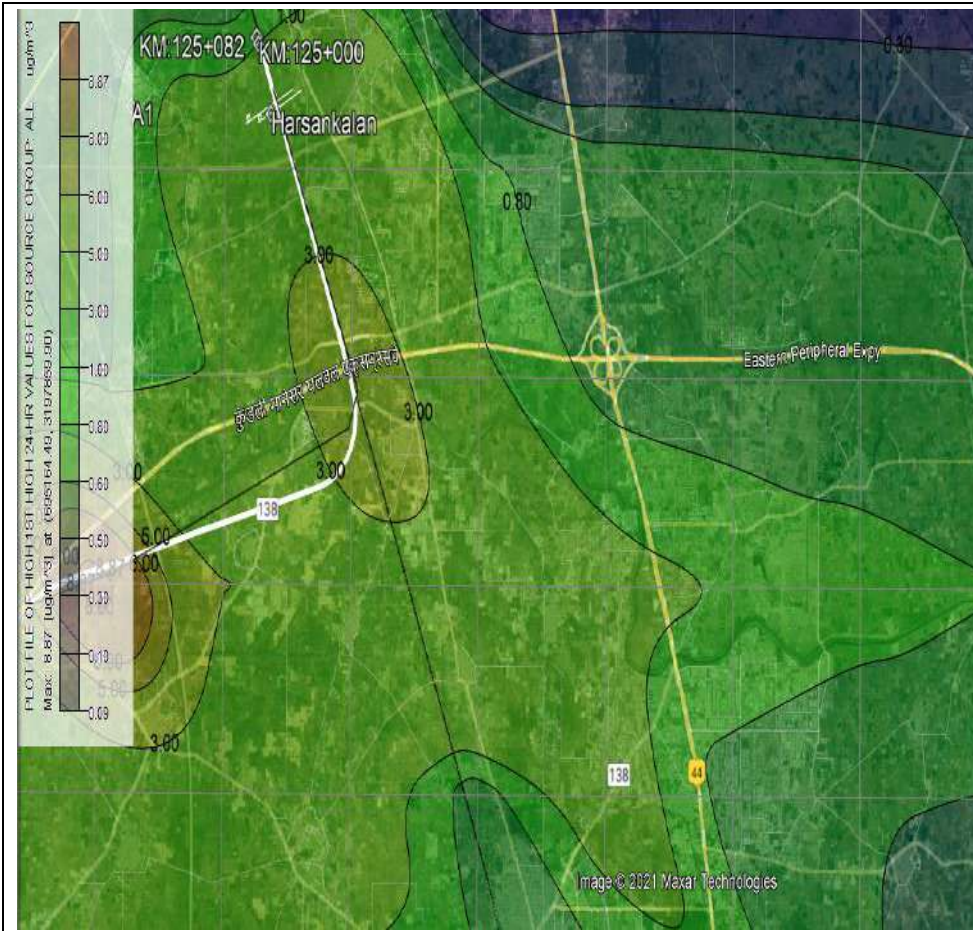


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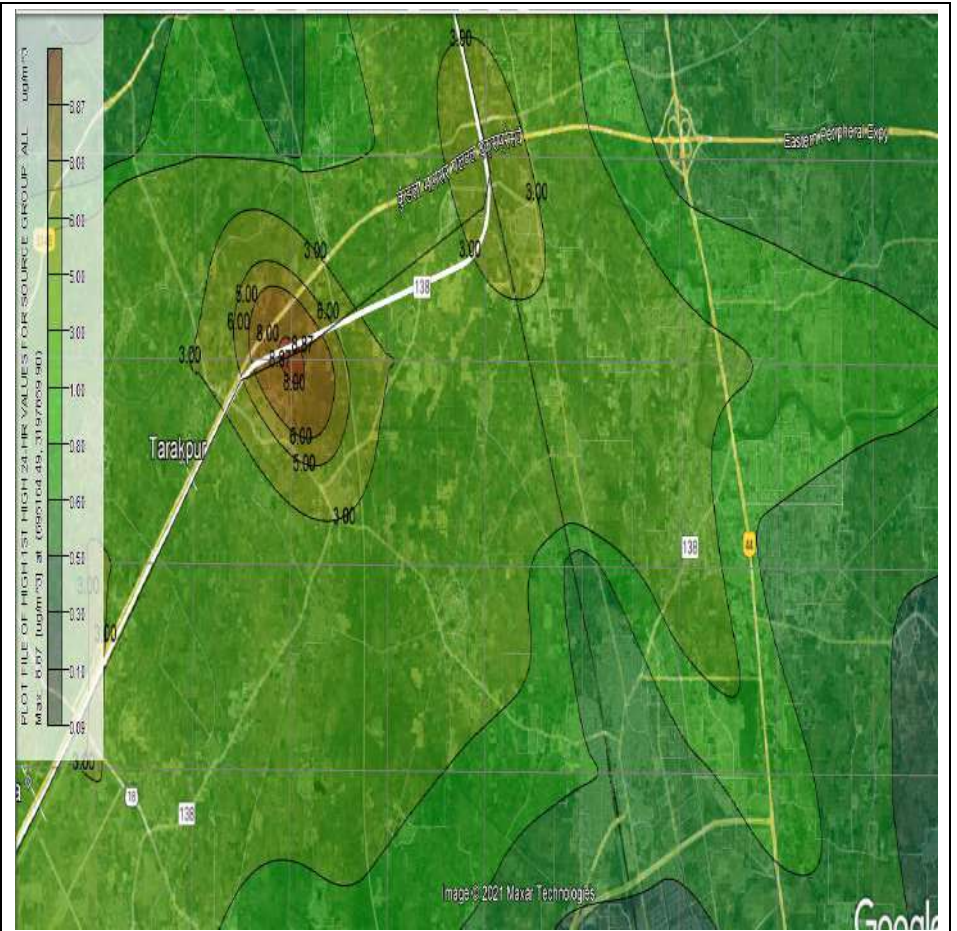


PM_{2.5} INCREMENTAL GLC AT NEW PRITHALA STATION LOCATION

PM₁₀ INCREMENTAL VALUES AT STATION LOCATIONS



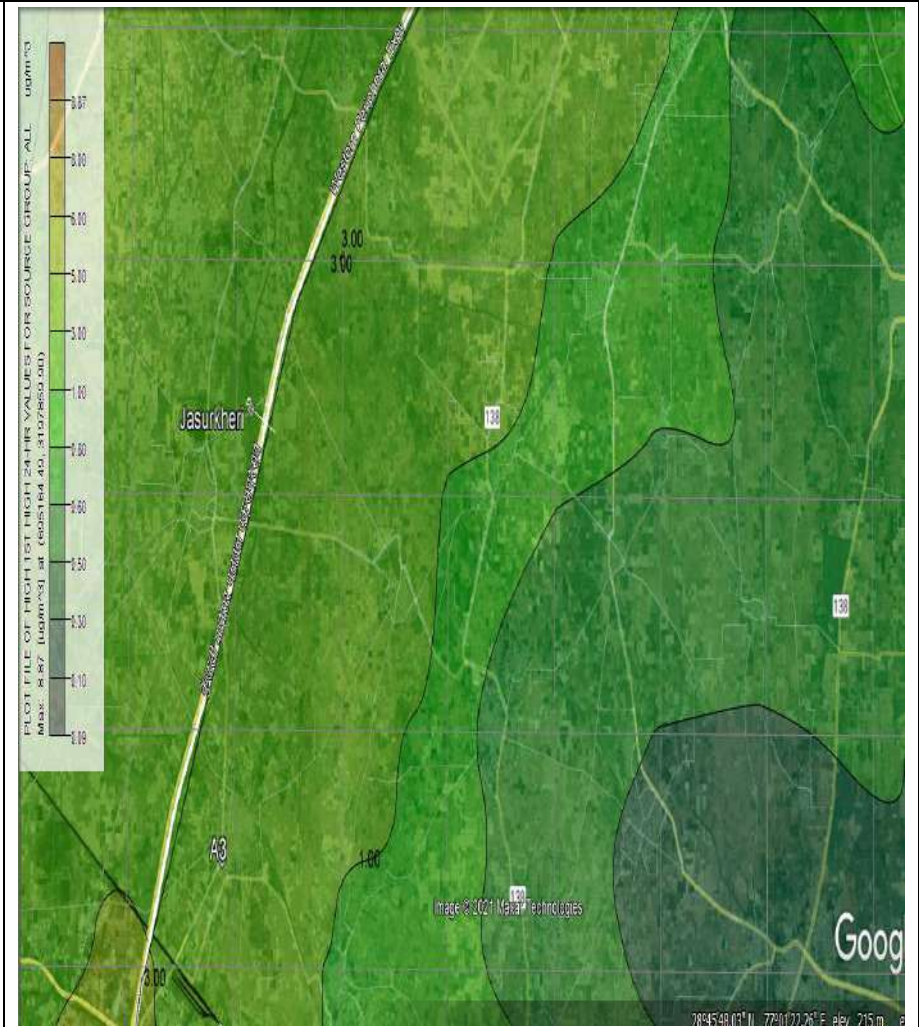
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PM₁₀ INCREMENTAL GLC AT TARAKPUR STATION LOCATION



PM₁₀ INCREMENTAL GLC AT KHARKHODA STATION LOCATION



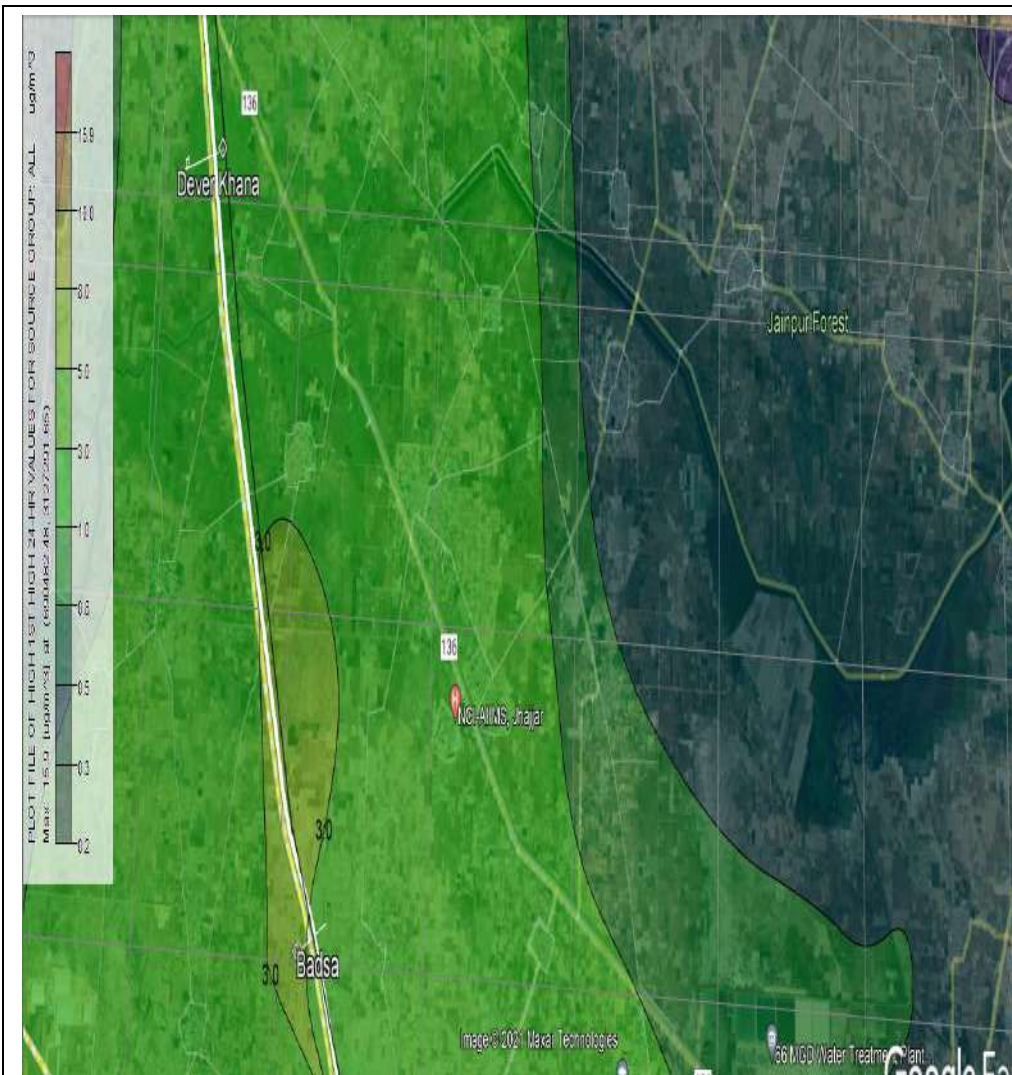
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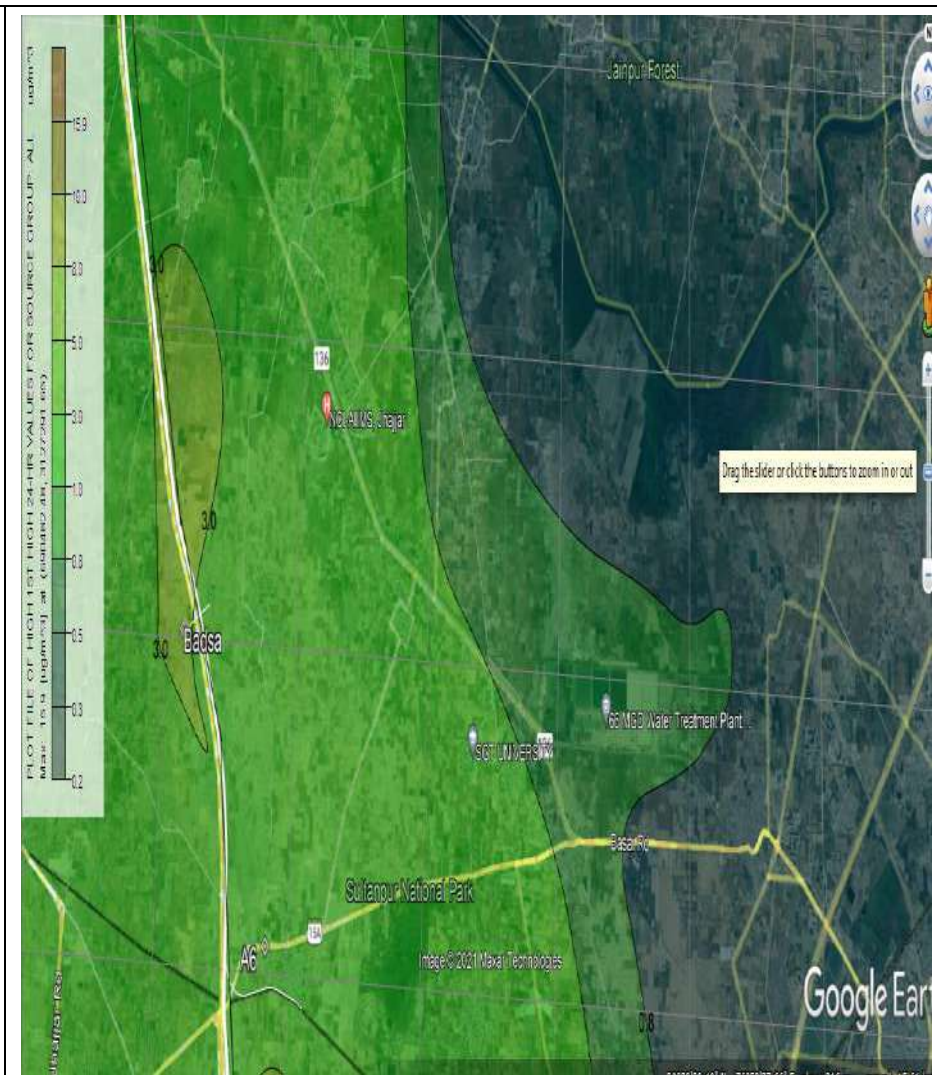
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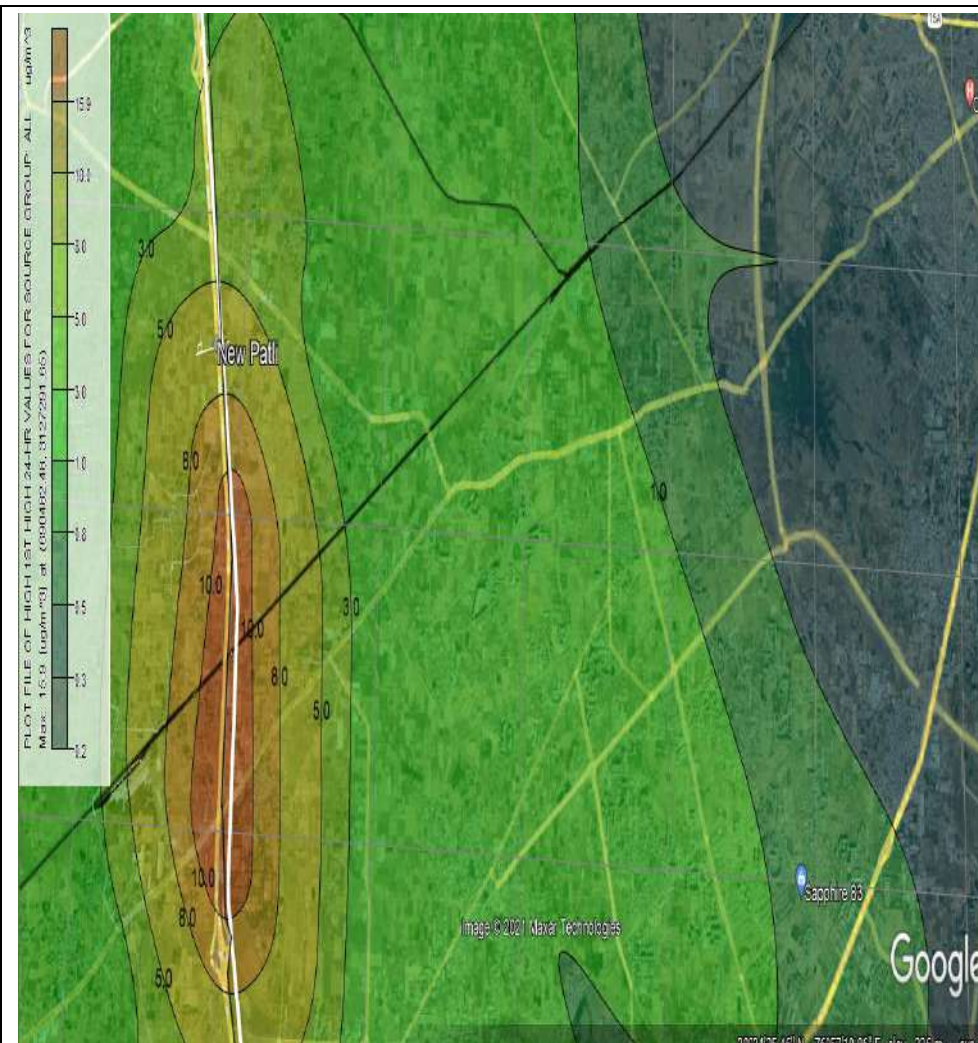
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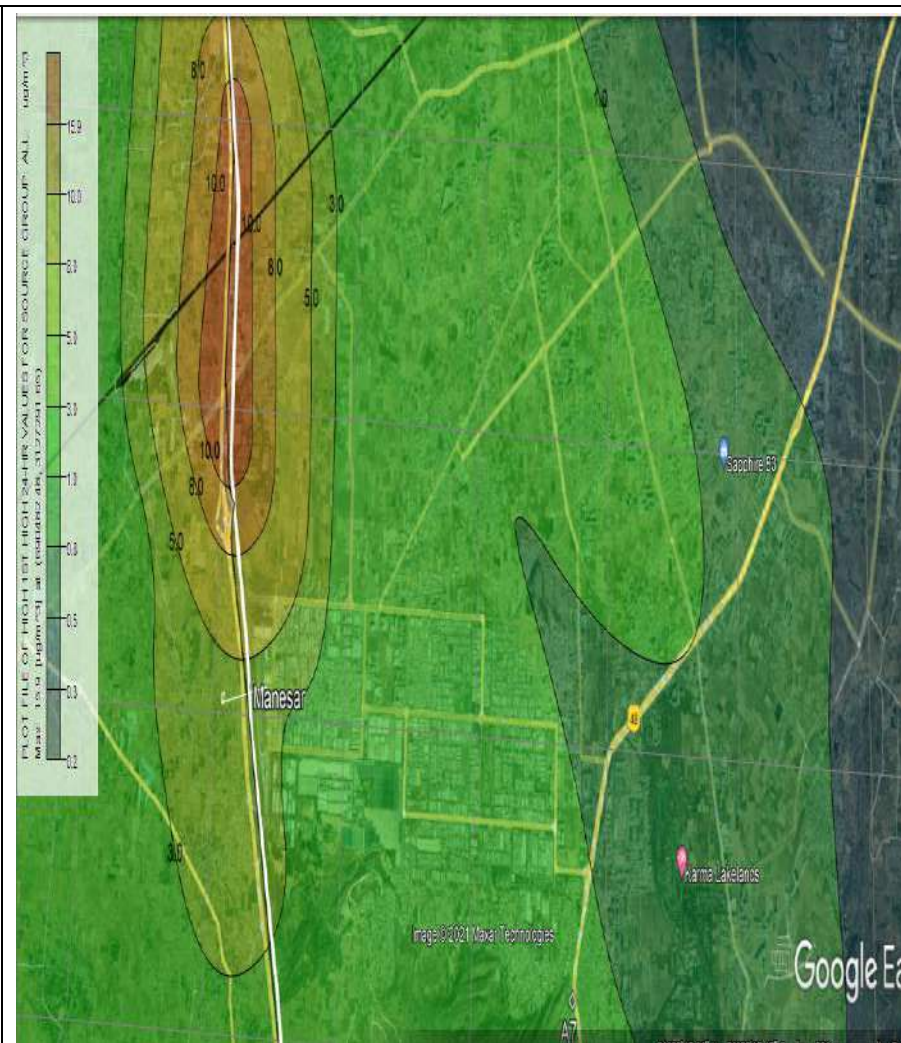
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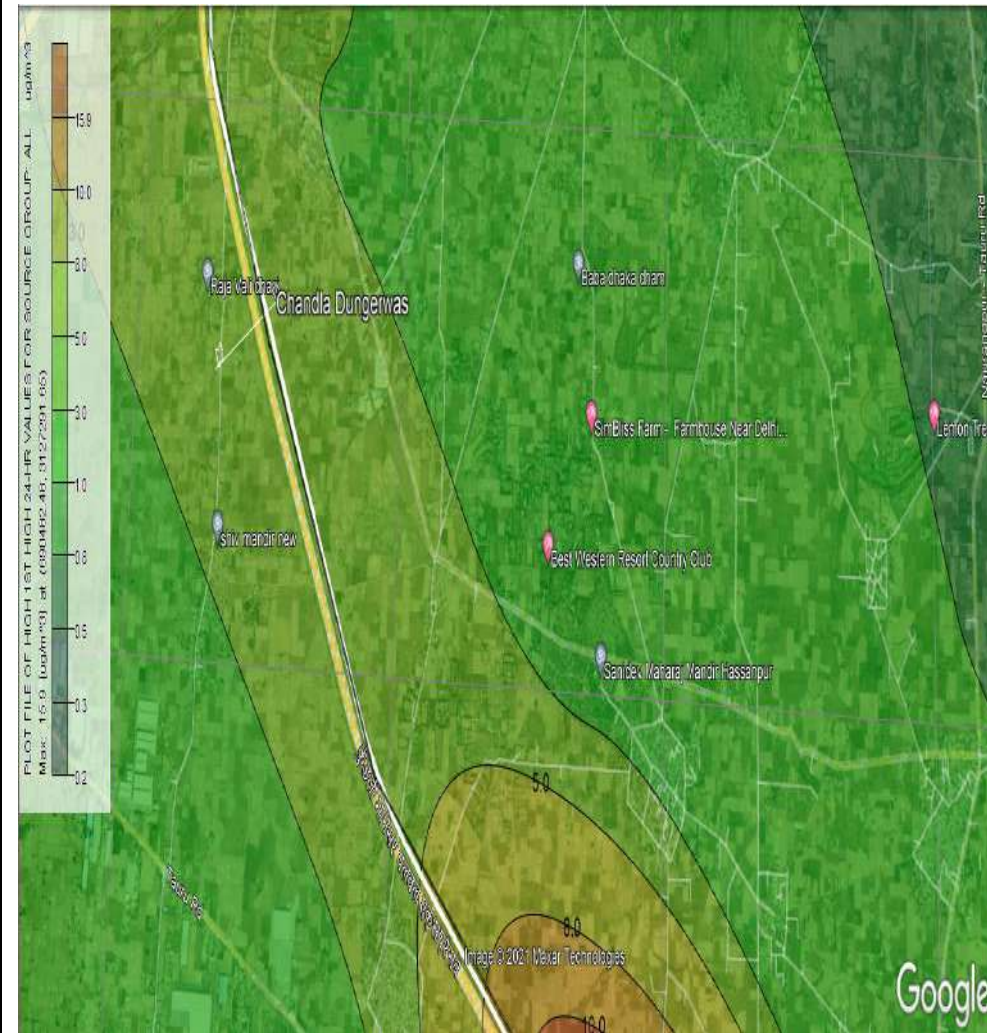
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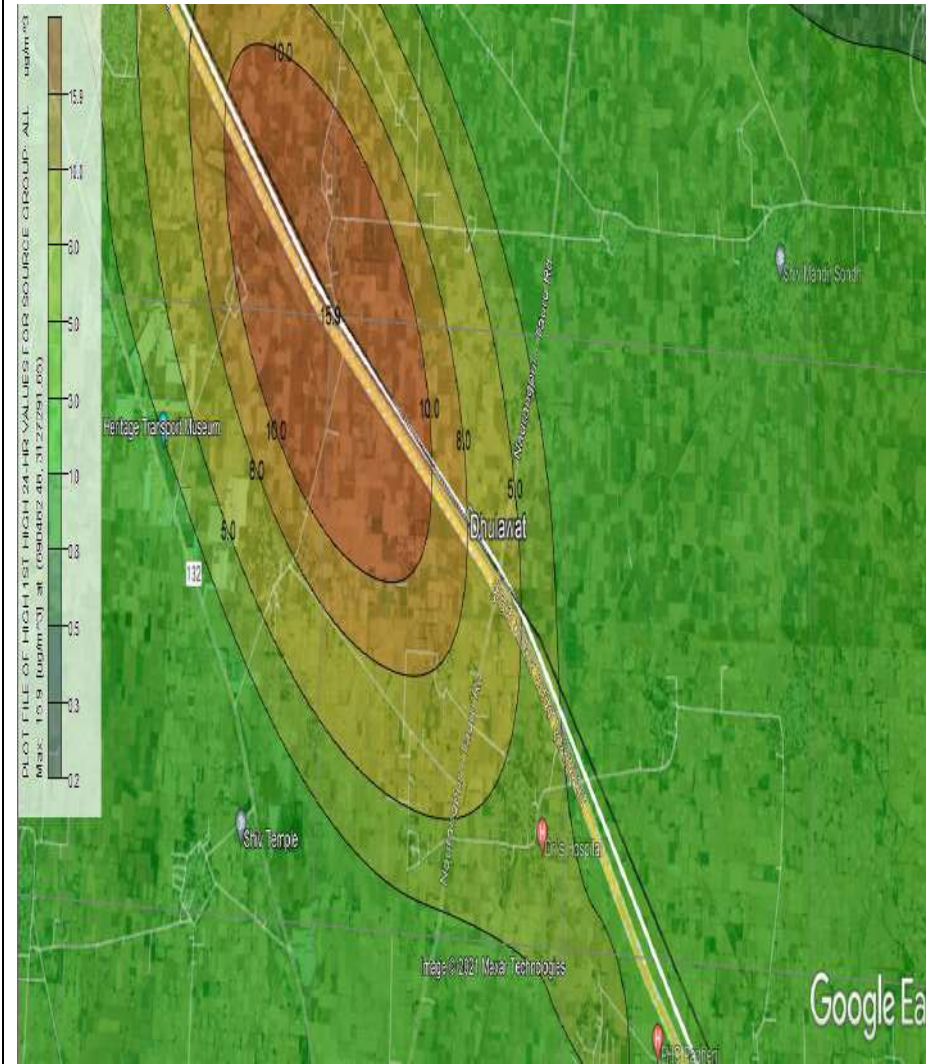
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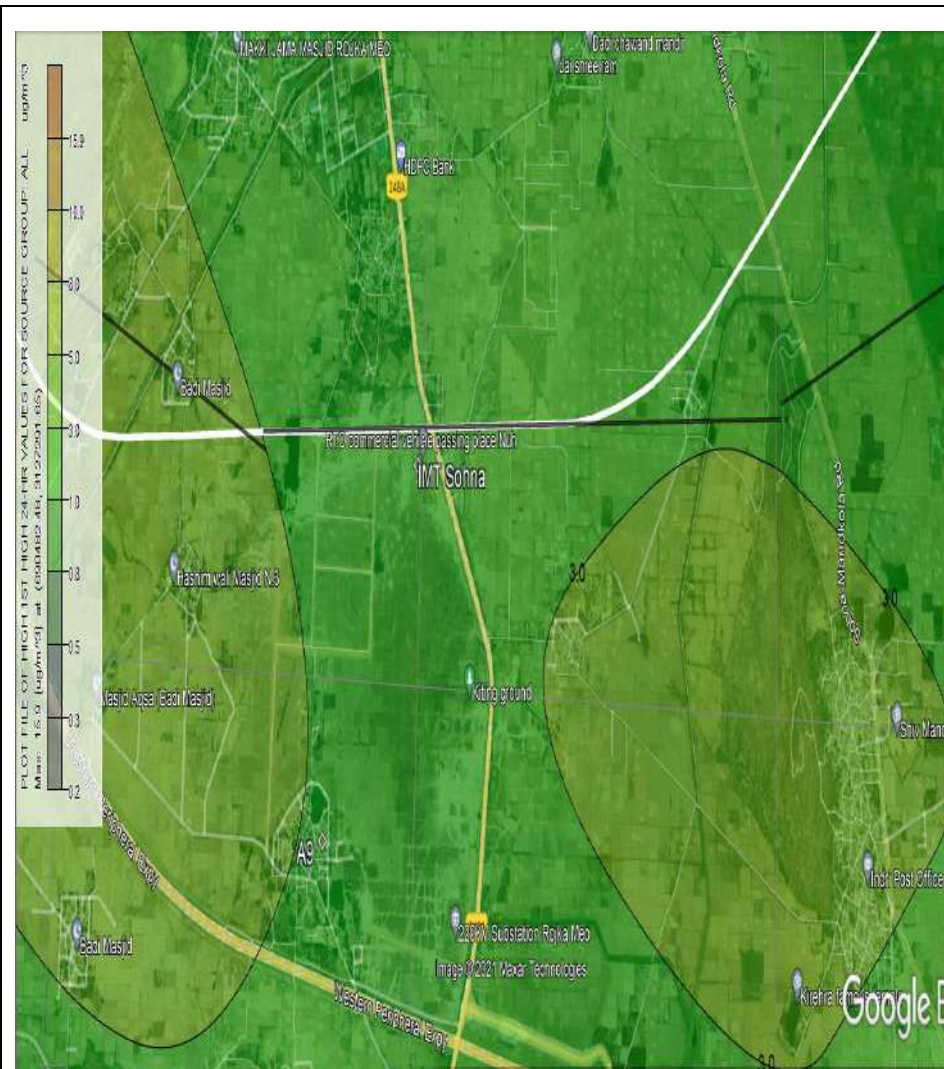
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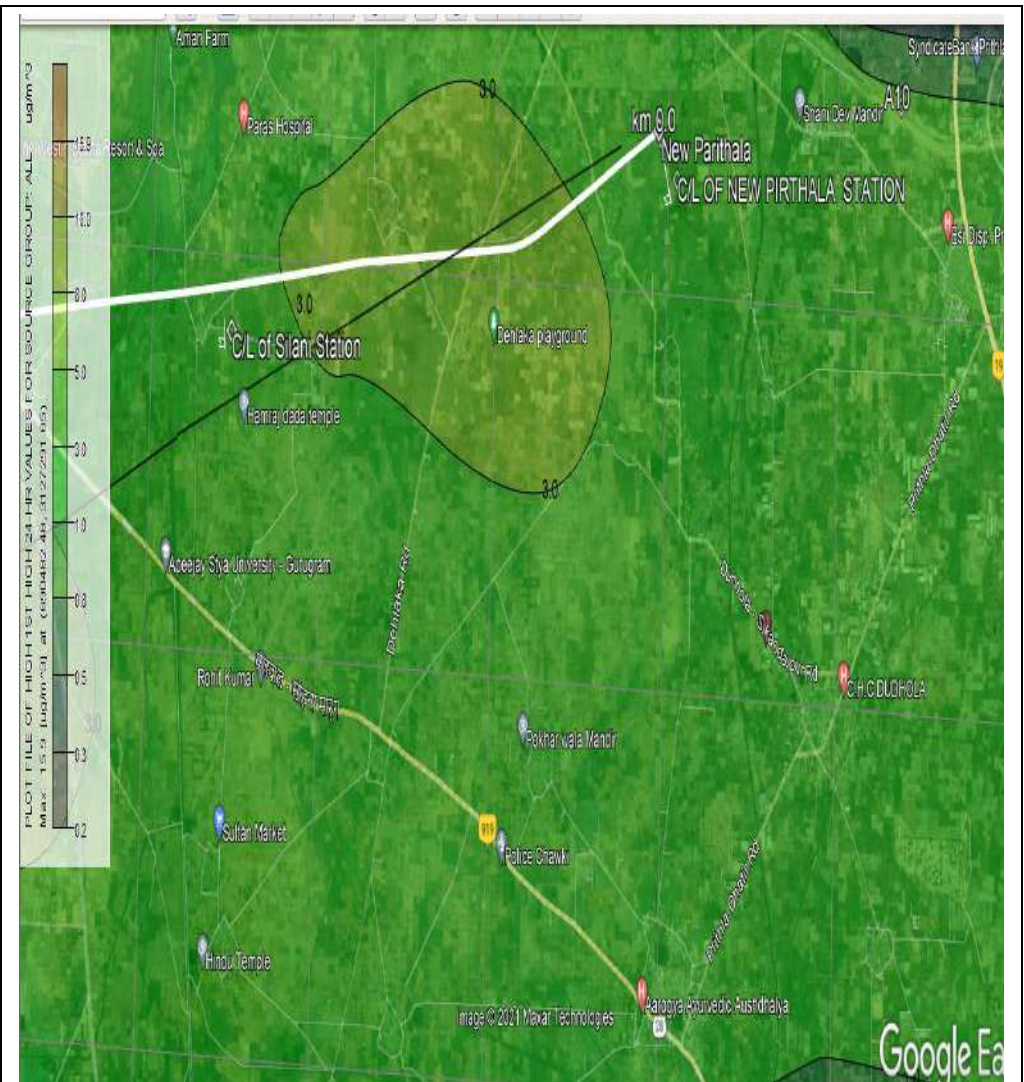
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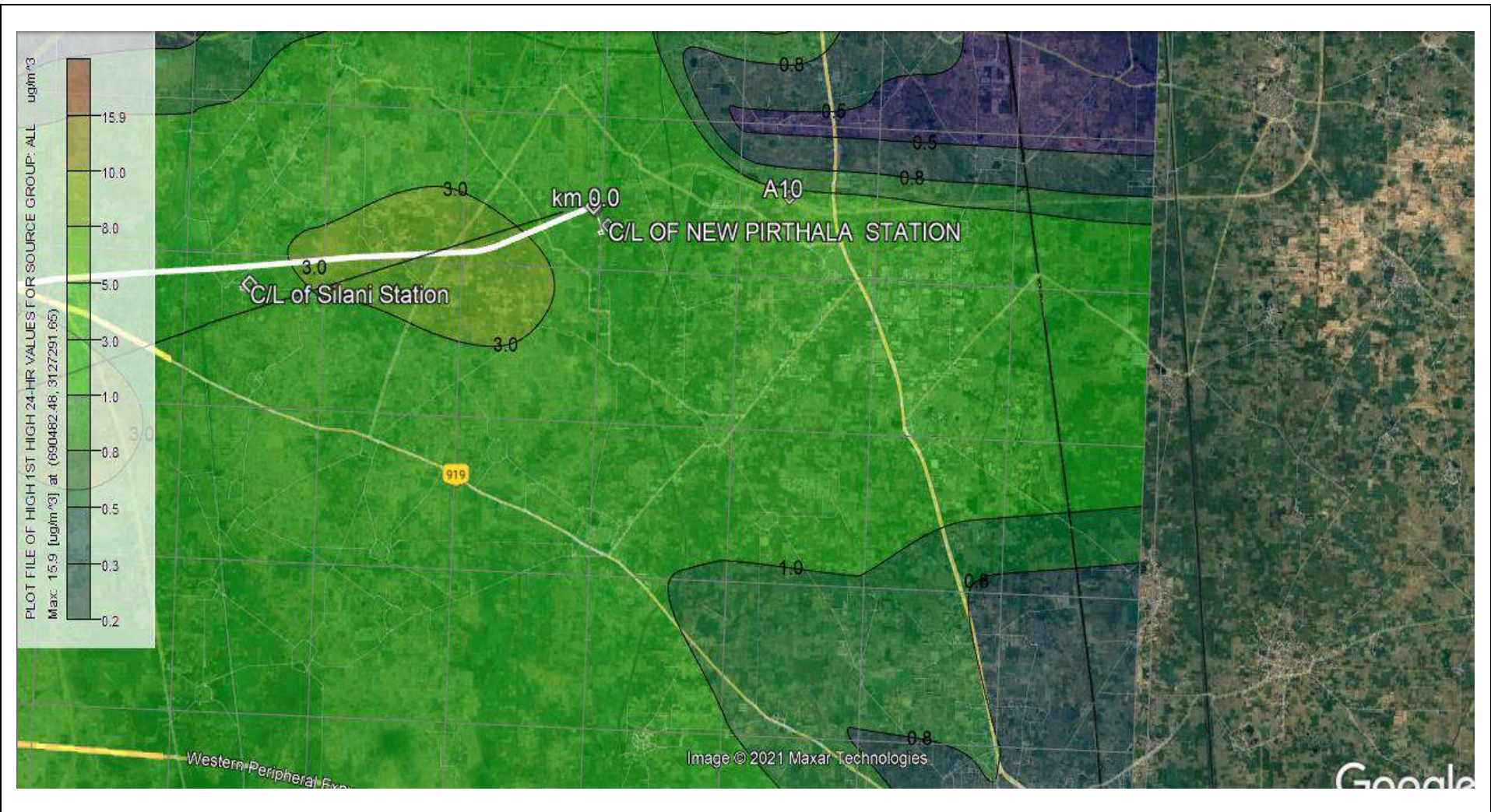
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PM₁₀ INCREMENTAL GLC AT IMT SOHNA STATION LOCATION

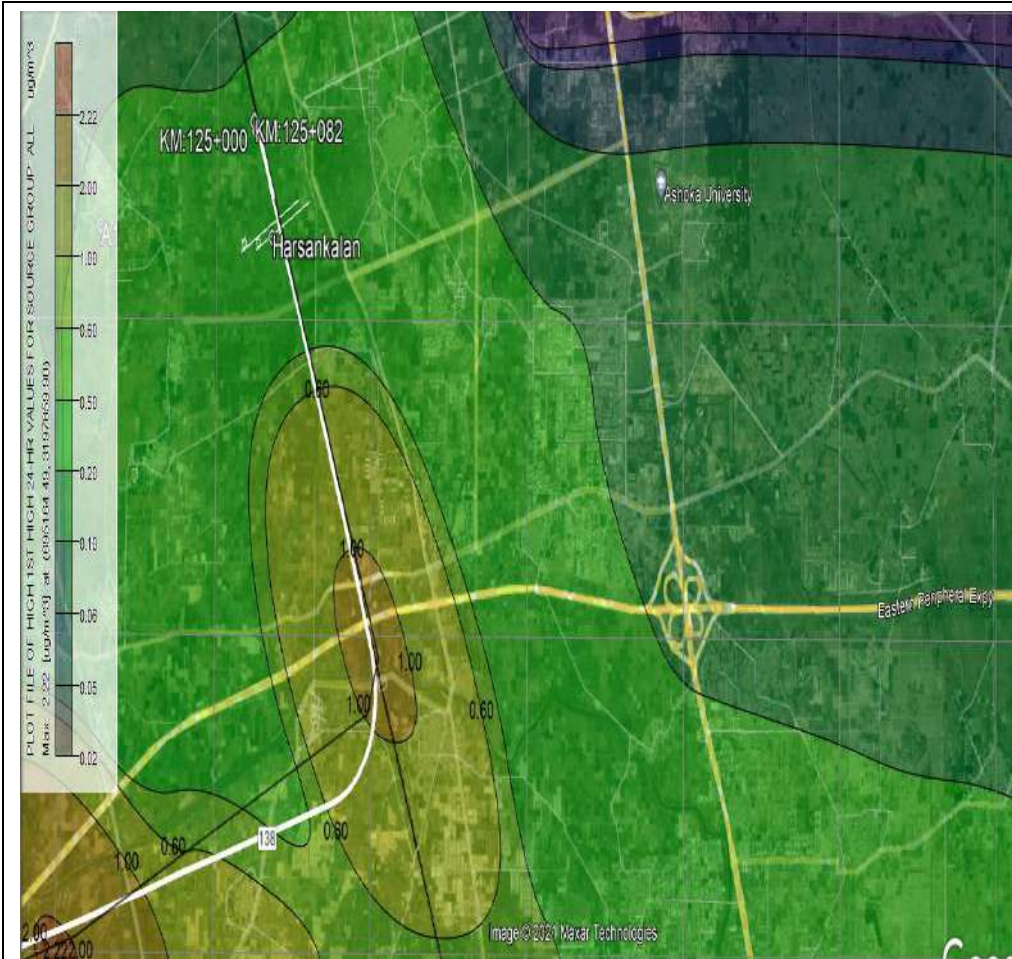


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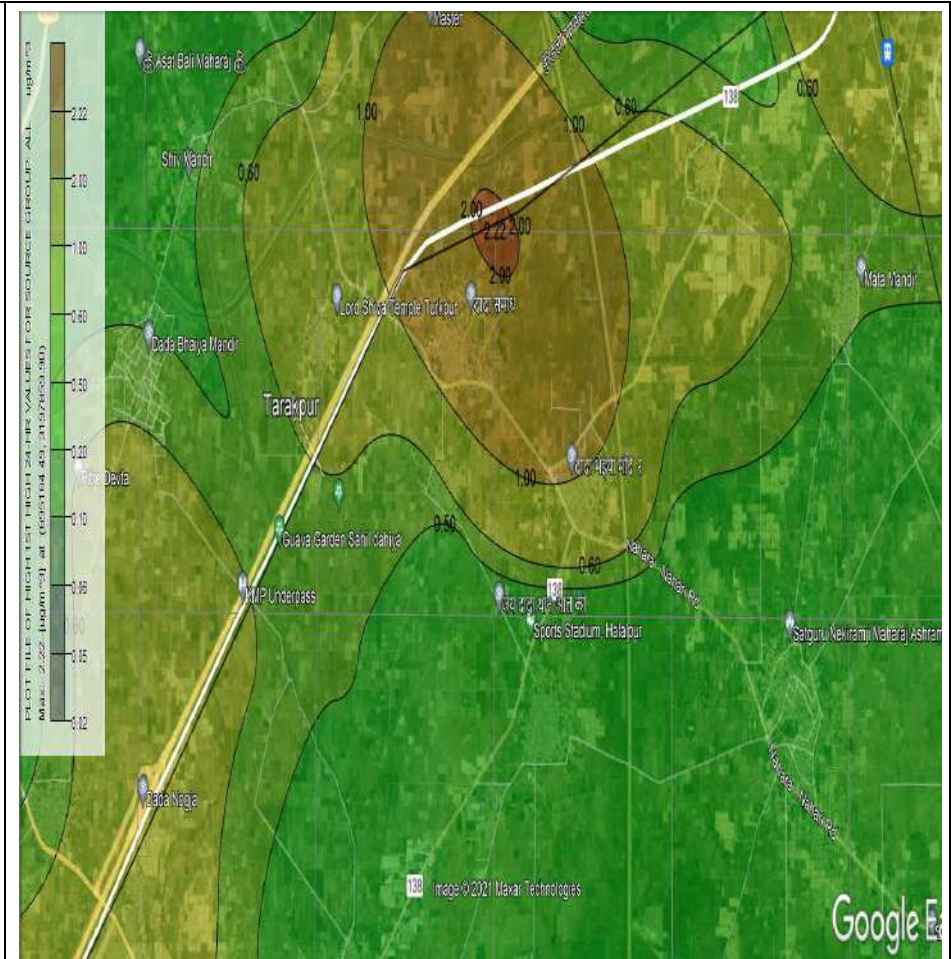


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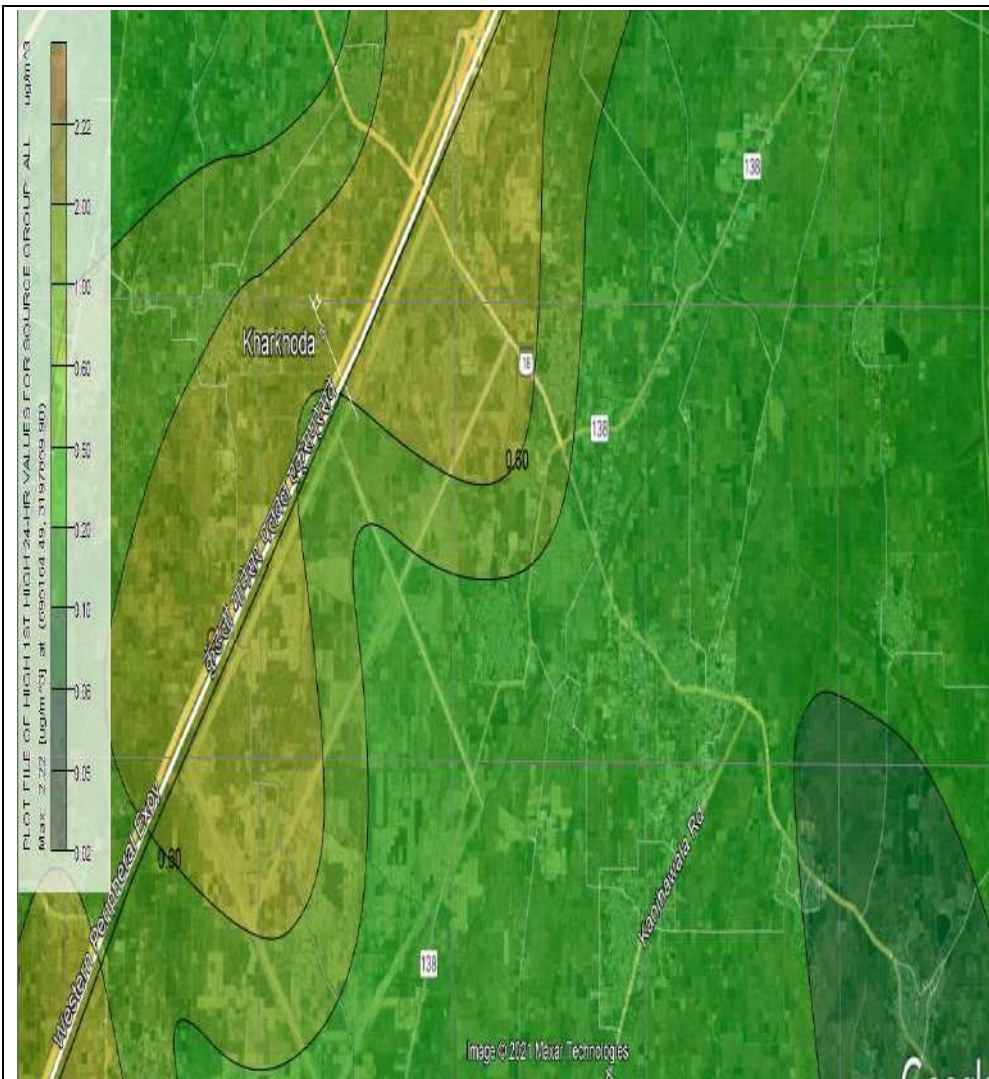
SO₂ INCREMENTAL VALUES AT INDIVIDUAL STATION LOCATIONS ARE GIVEN BELOW:



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SO₂ INCREMENTAL GLC AT TARAKPUR STATION LOCATION



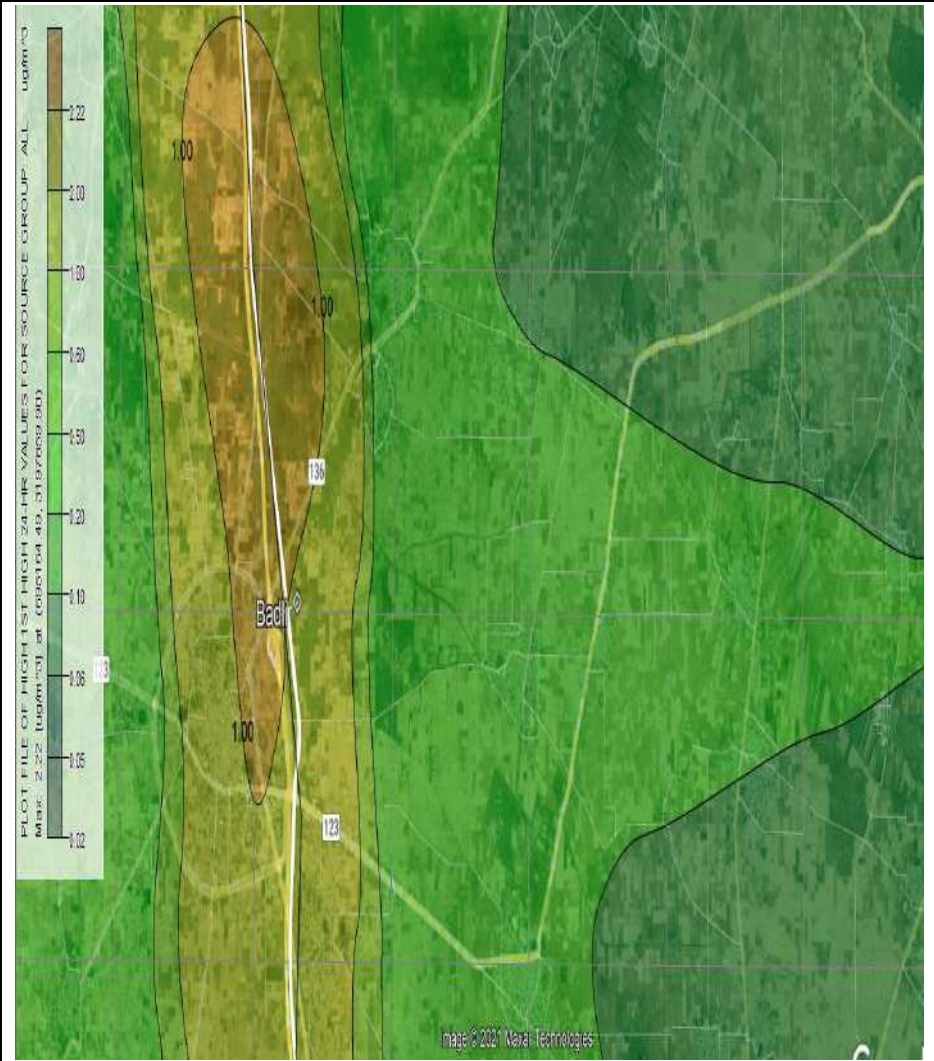
SO₂ INCREMENTAL GLC AT KHARKHODA STATION LOCATION



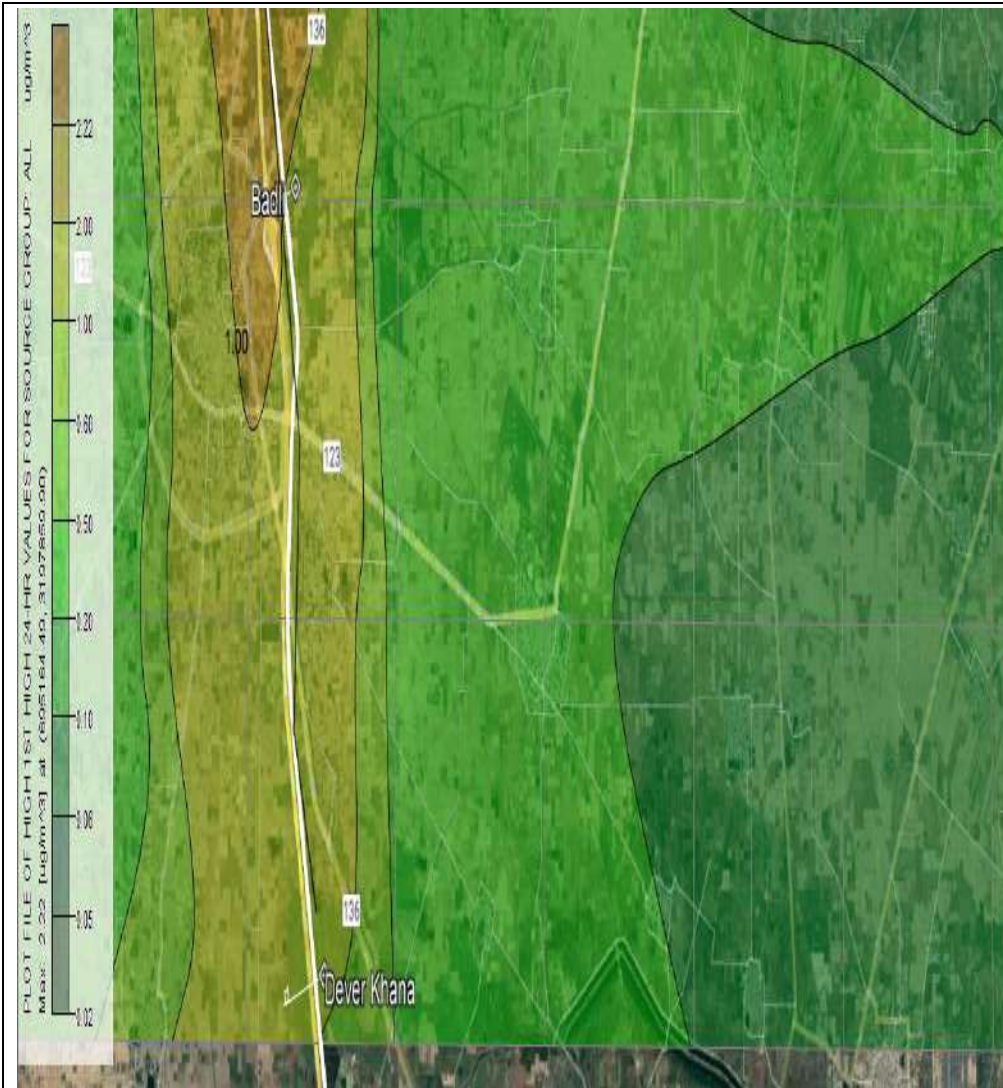
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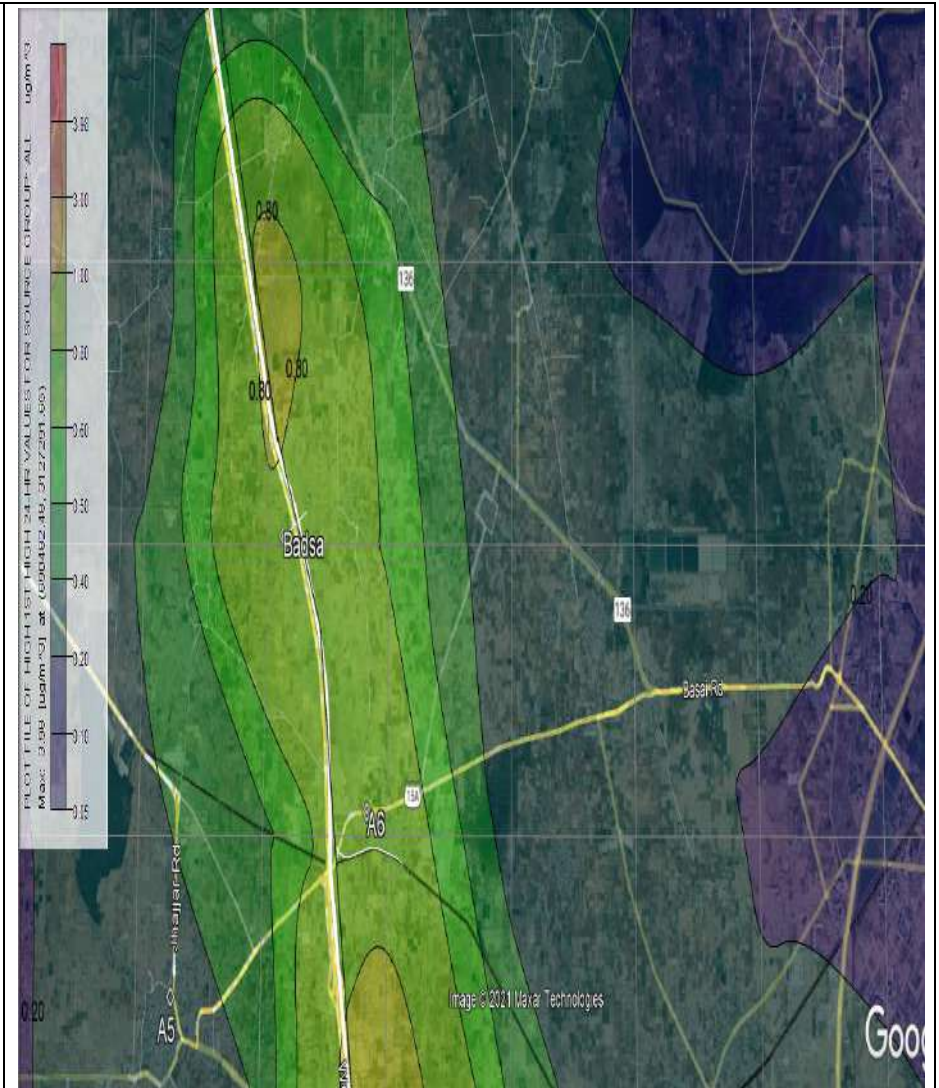
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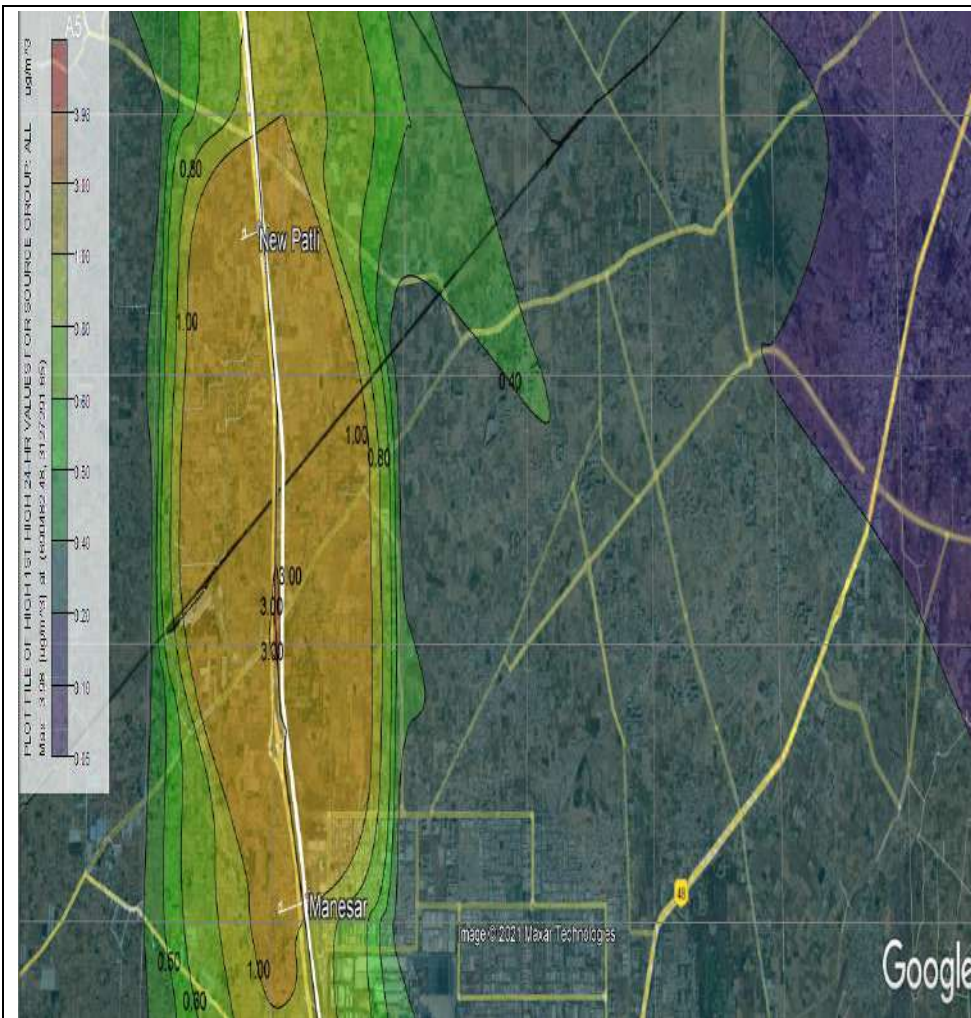
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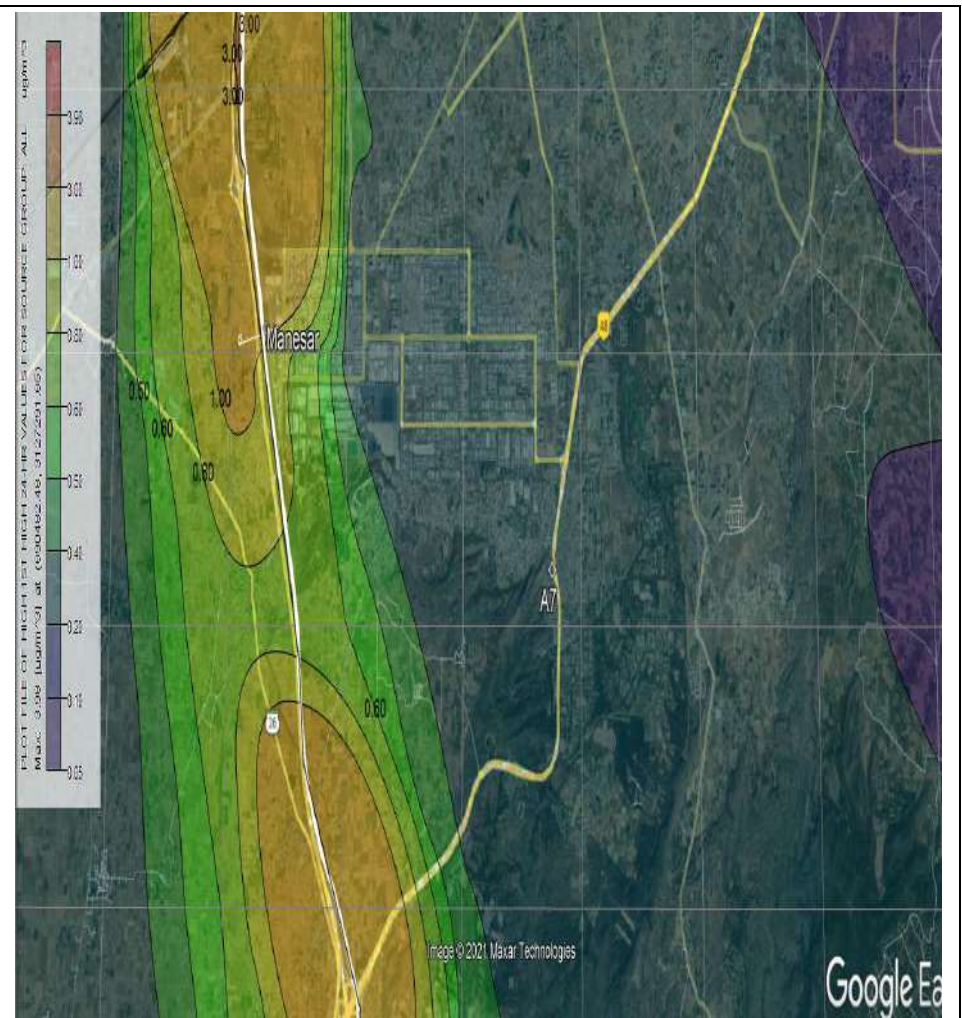
SO₂ INCREMENTAL GLC AT DEVARKHANA STATION LOCATION



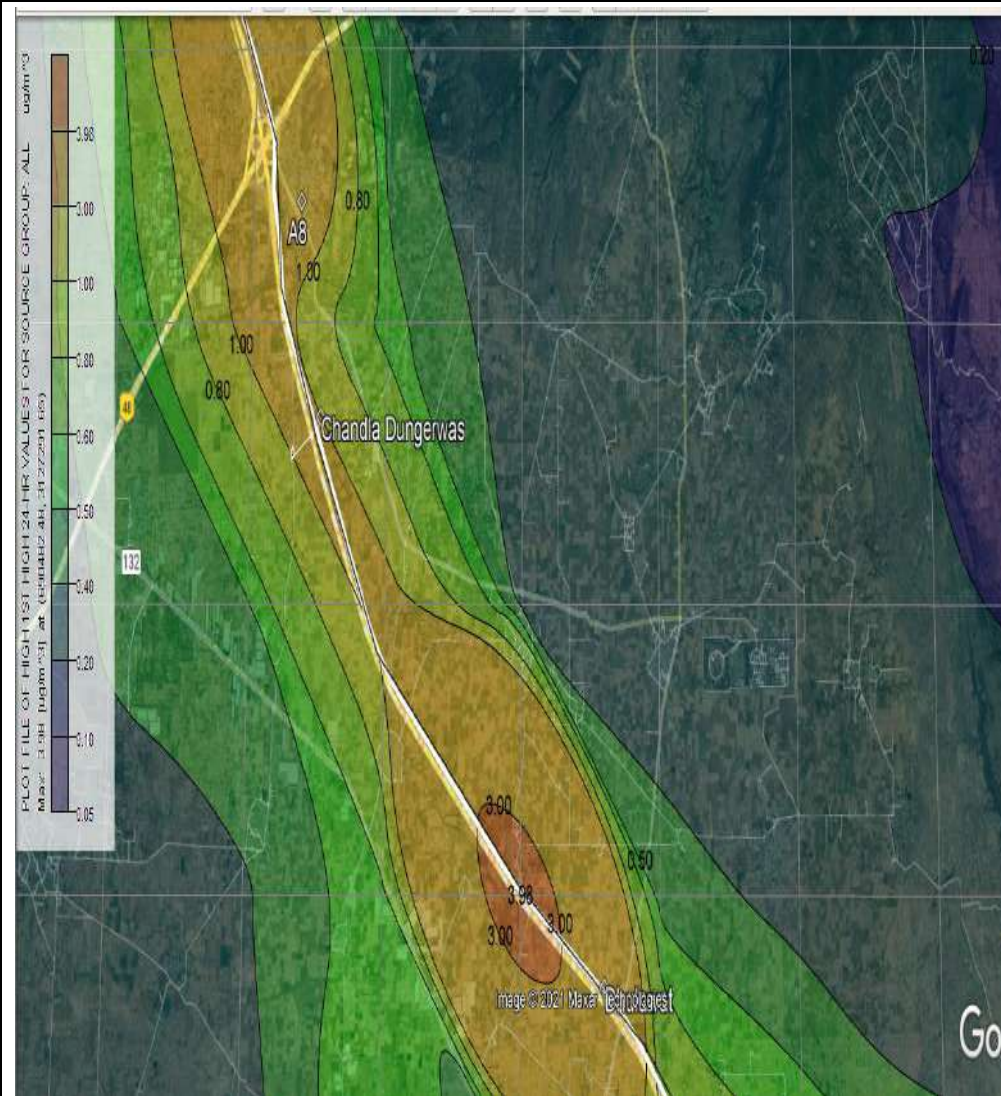
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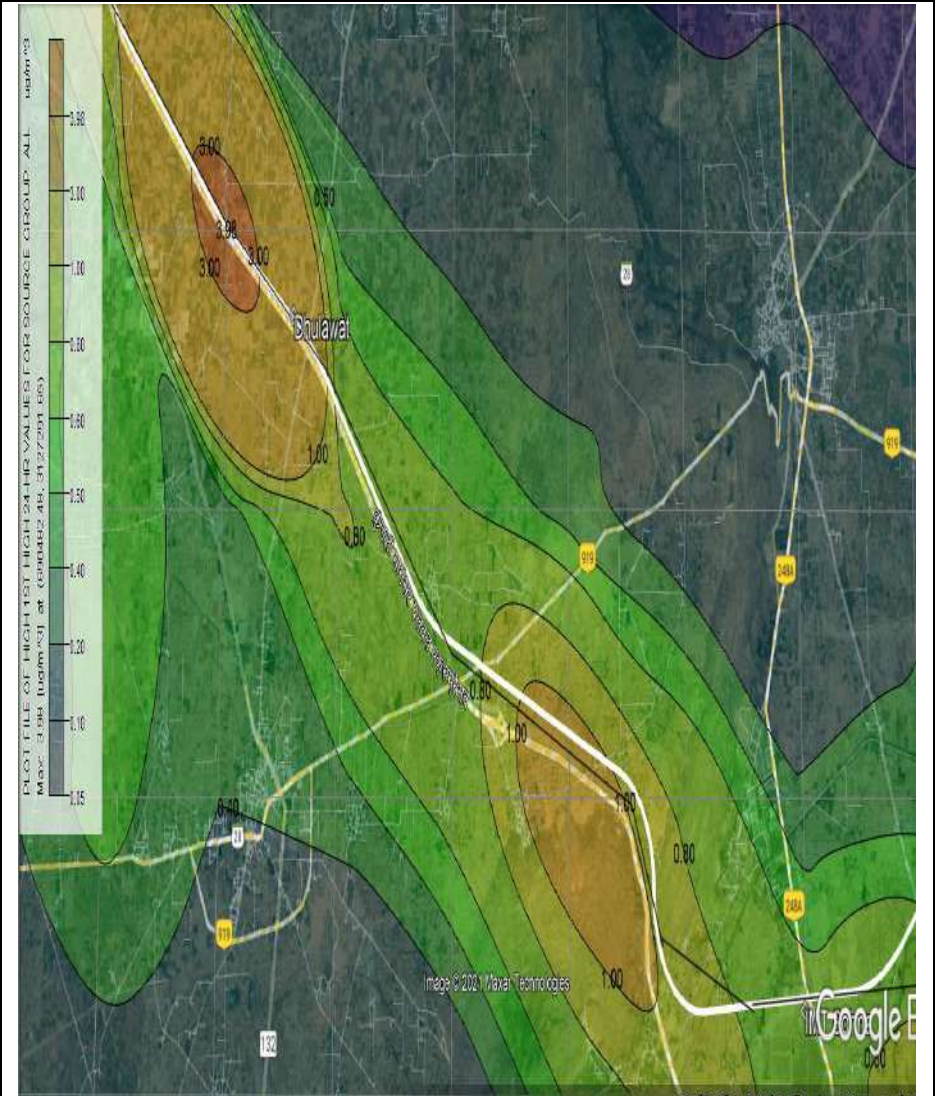
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SO₂ INCREMENTAL GLC AT MANESAR STATION LOCATION



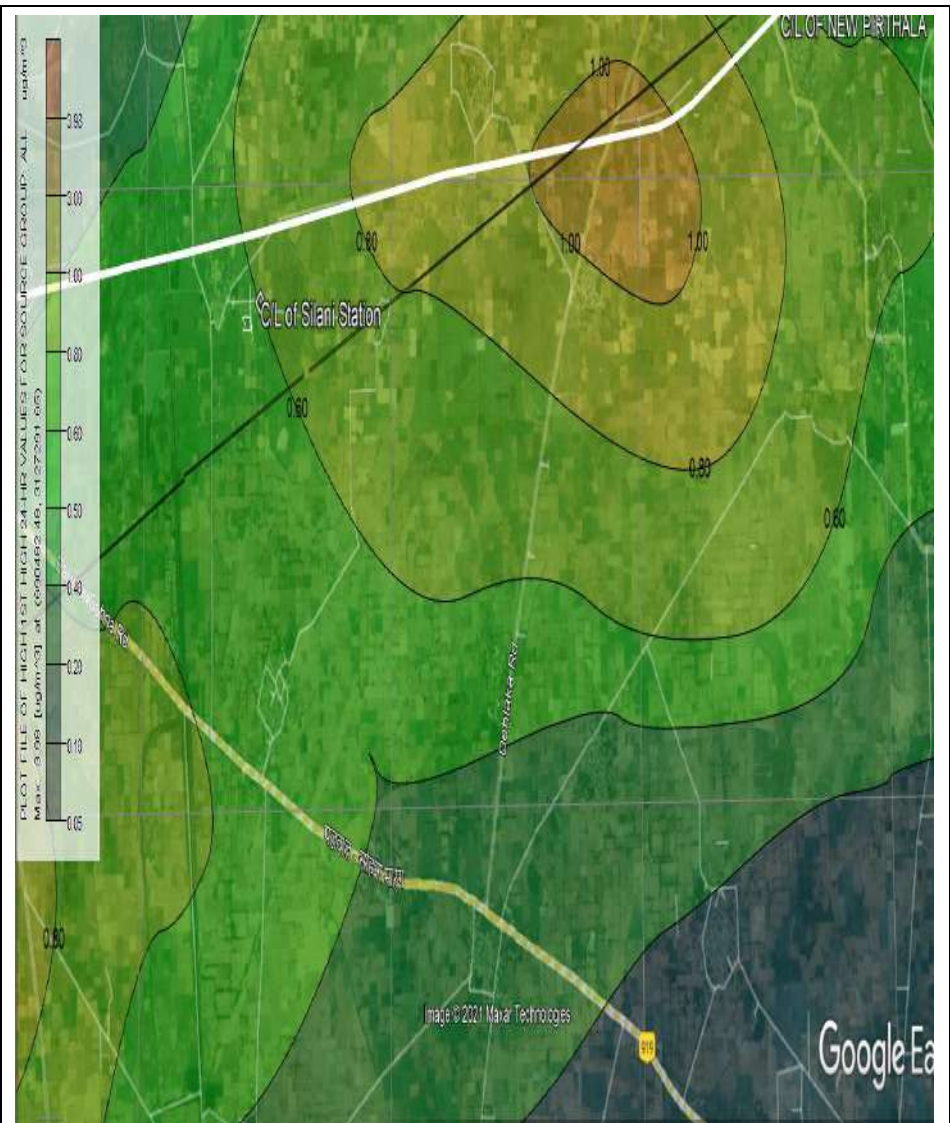
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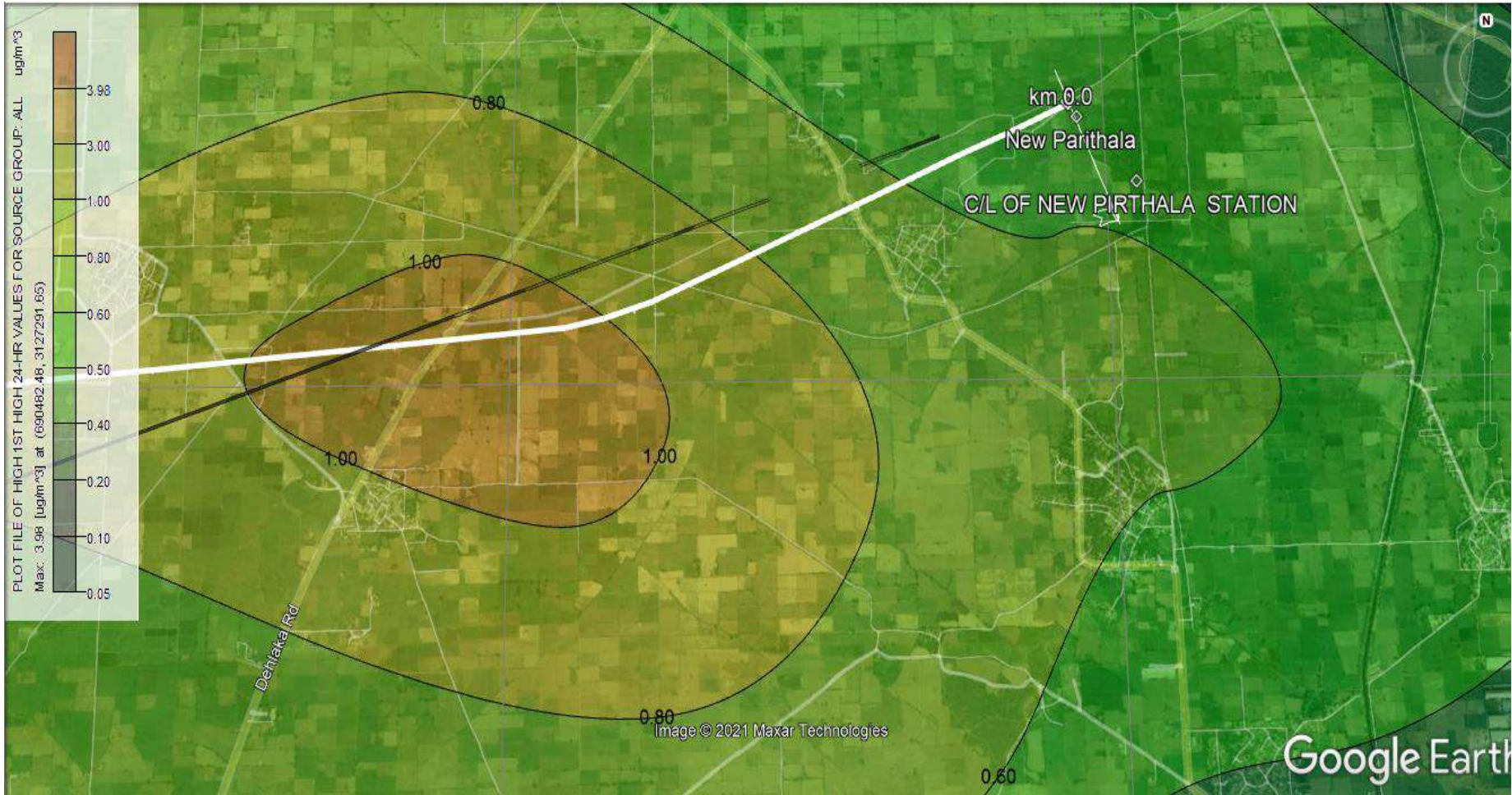
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SO₂ INCREMENTAL GLC AT IMT SOHNA STATION LOCATION



SO₂ INCREMENTAL GLC AT SILANI STATION LOCATION

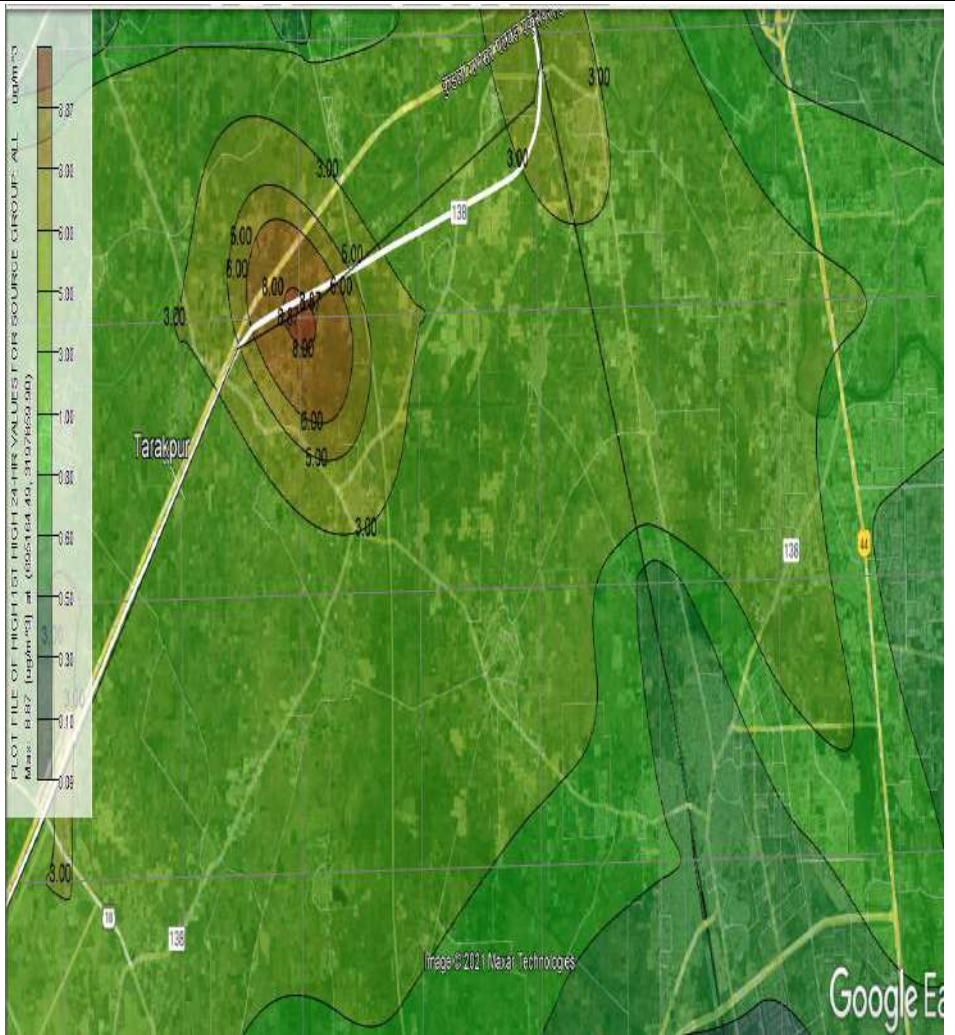


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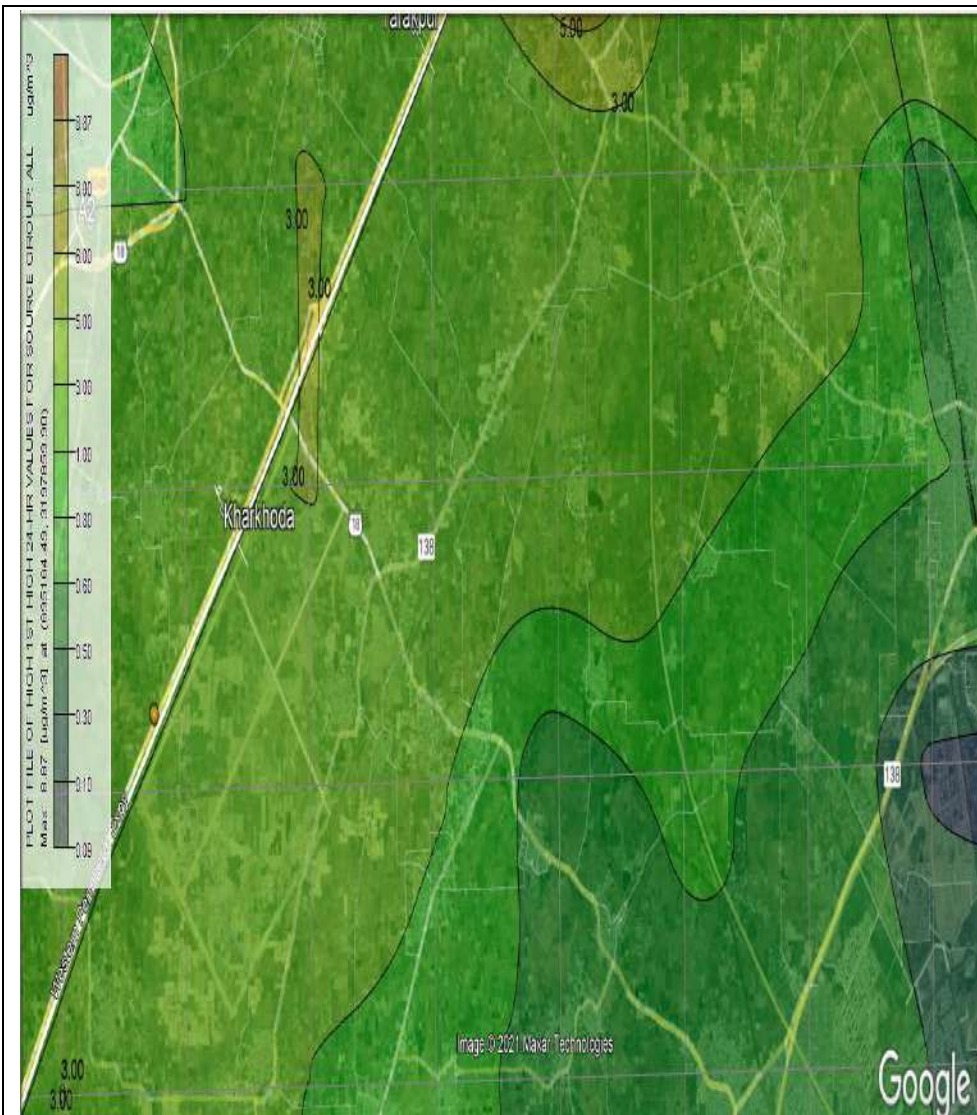
NO₂ INCREMENTAL VALUES AT INDIVIDUAL STATIONS



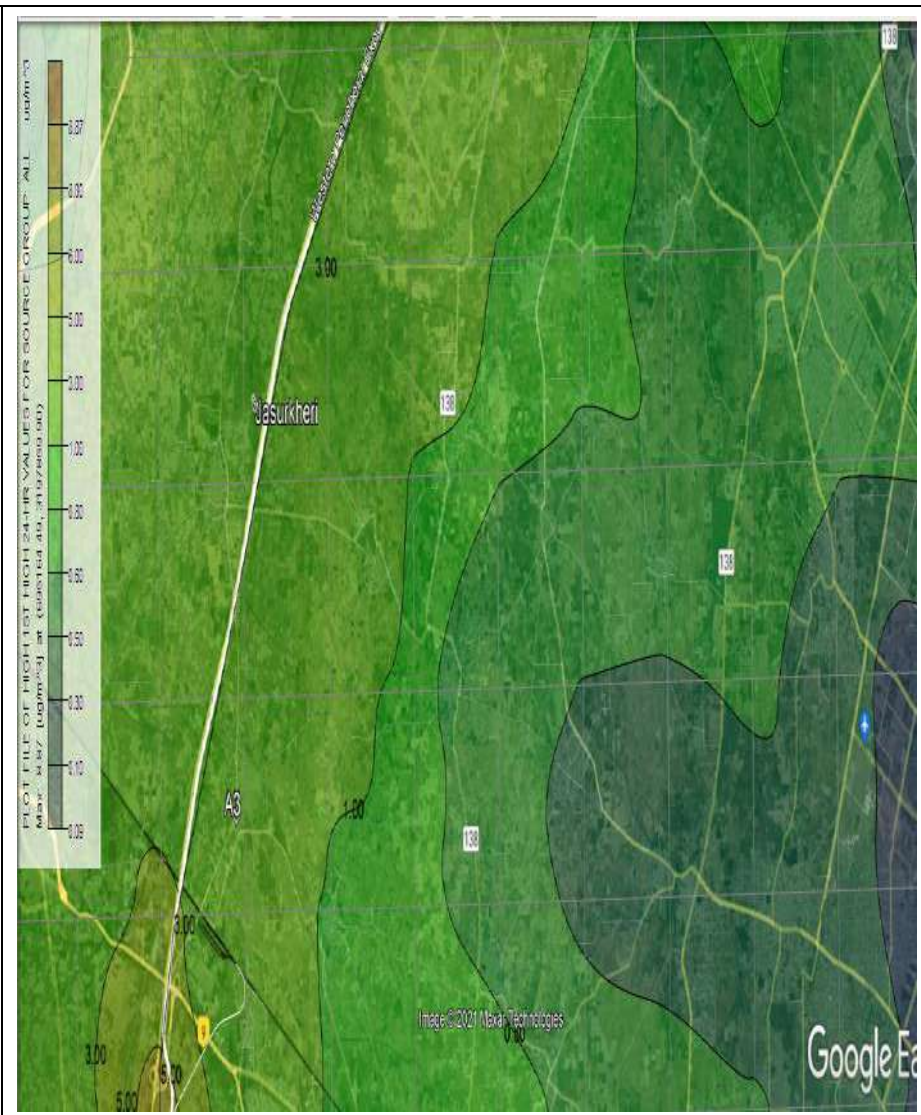
NO₂ INCREMENTAL GLC AT HARSANAKALAN STATION LOCATION



NO₂ INCREMENTAL GLC AT TARAKPUR STATION LOCATION



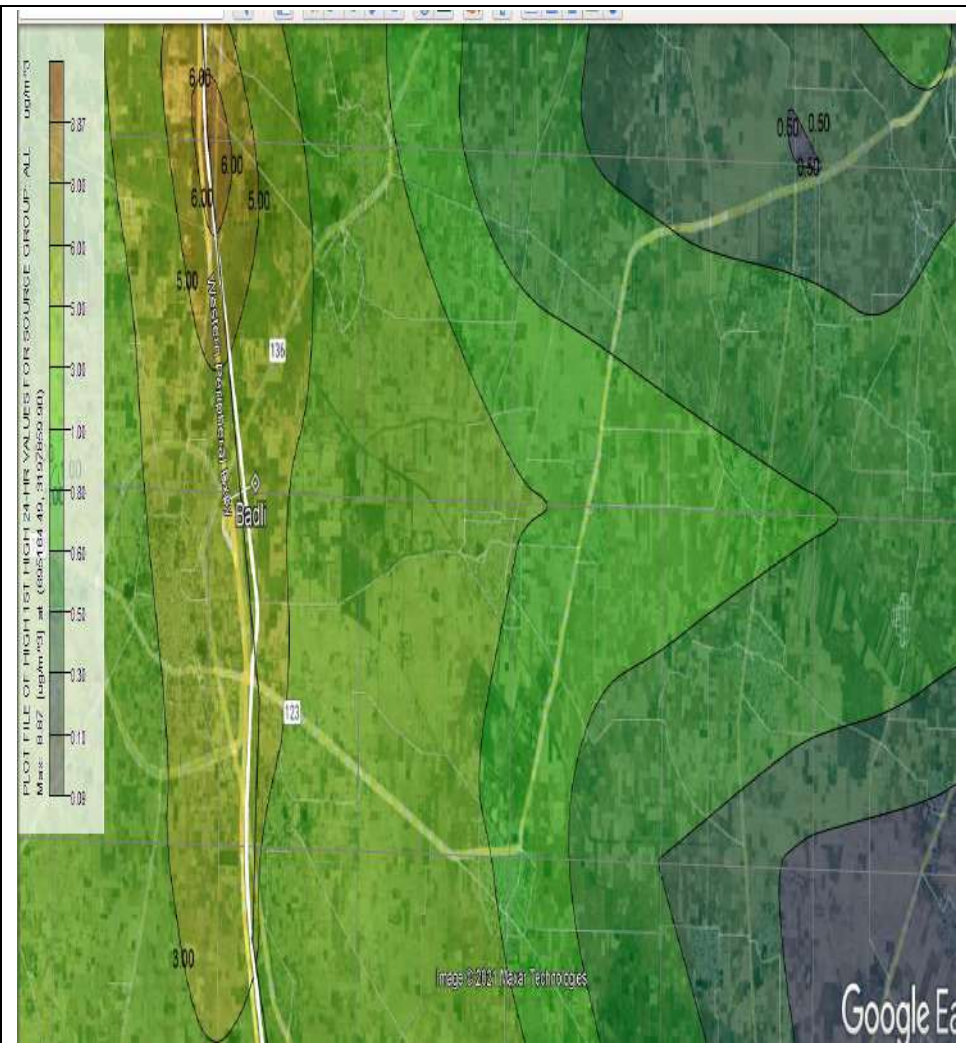
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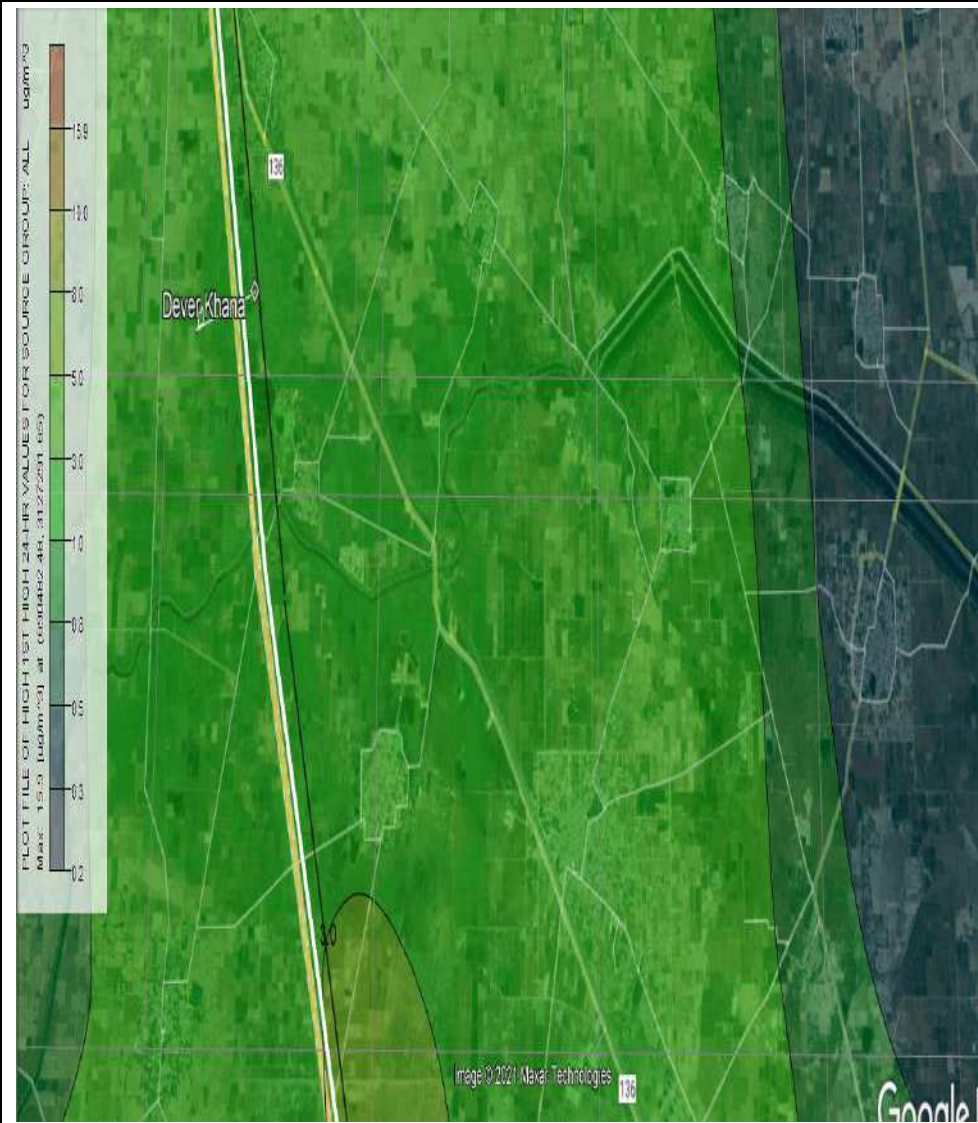
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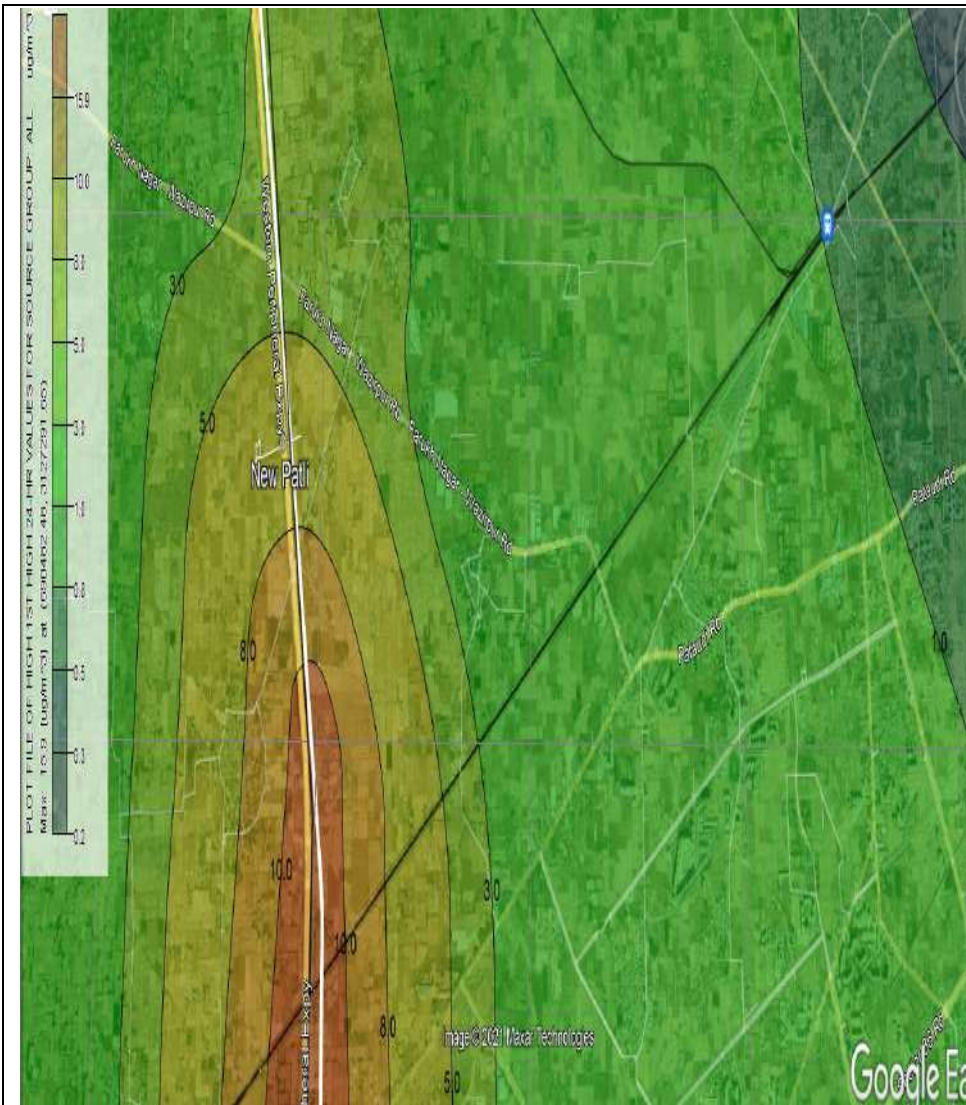
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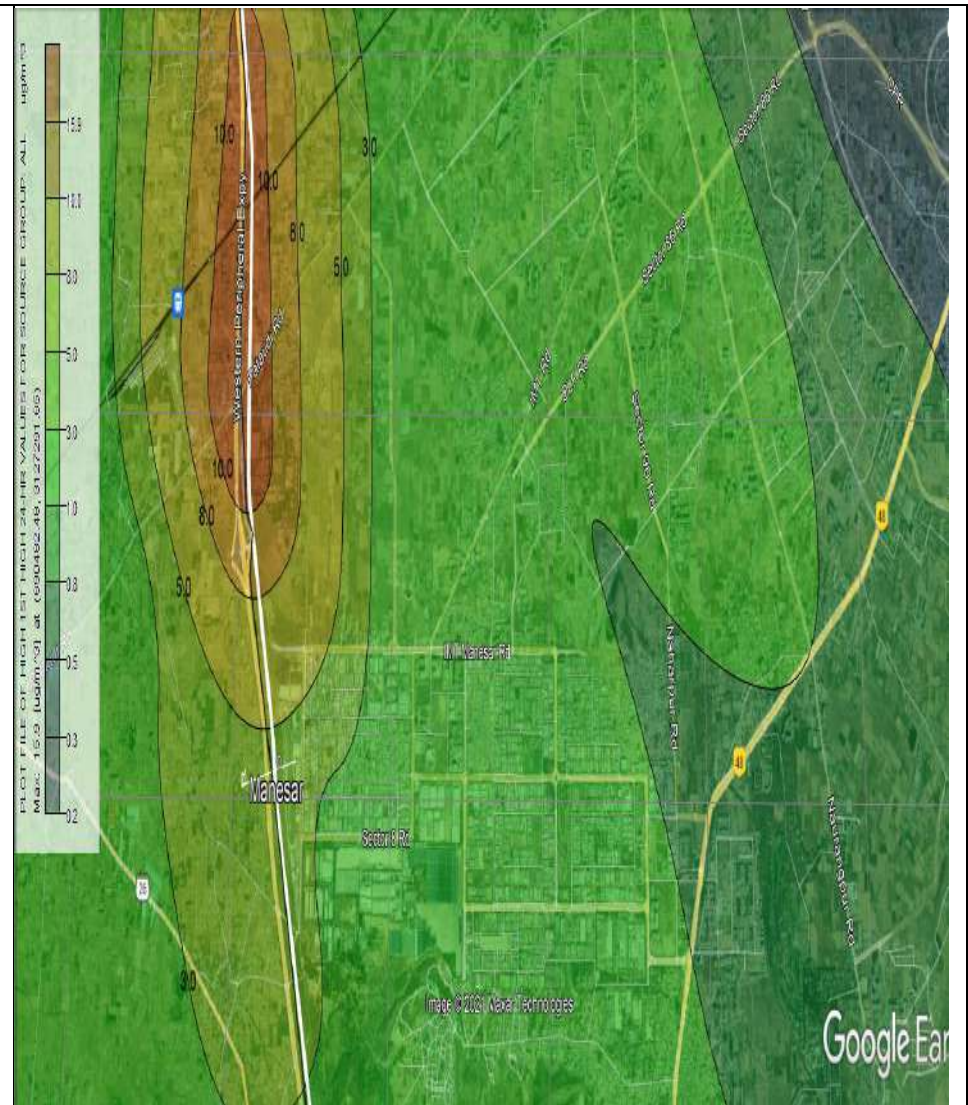
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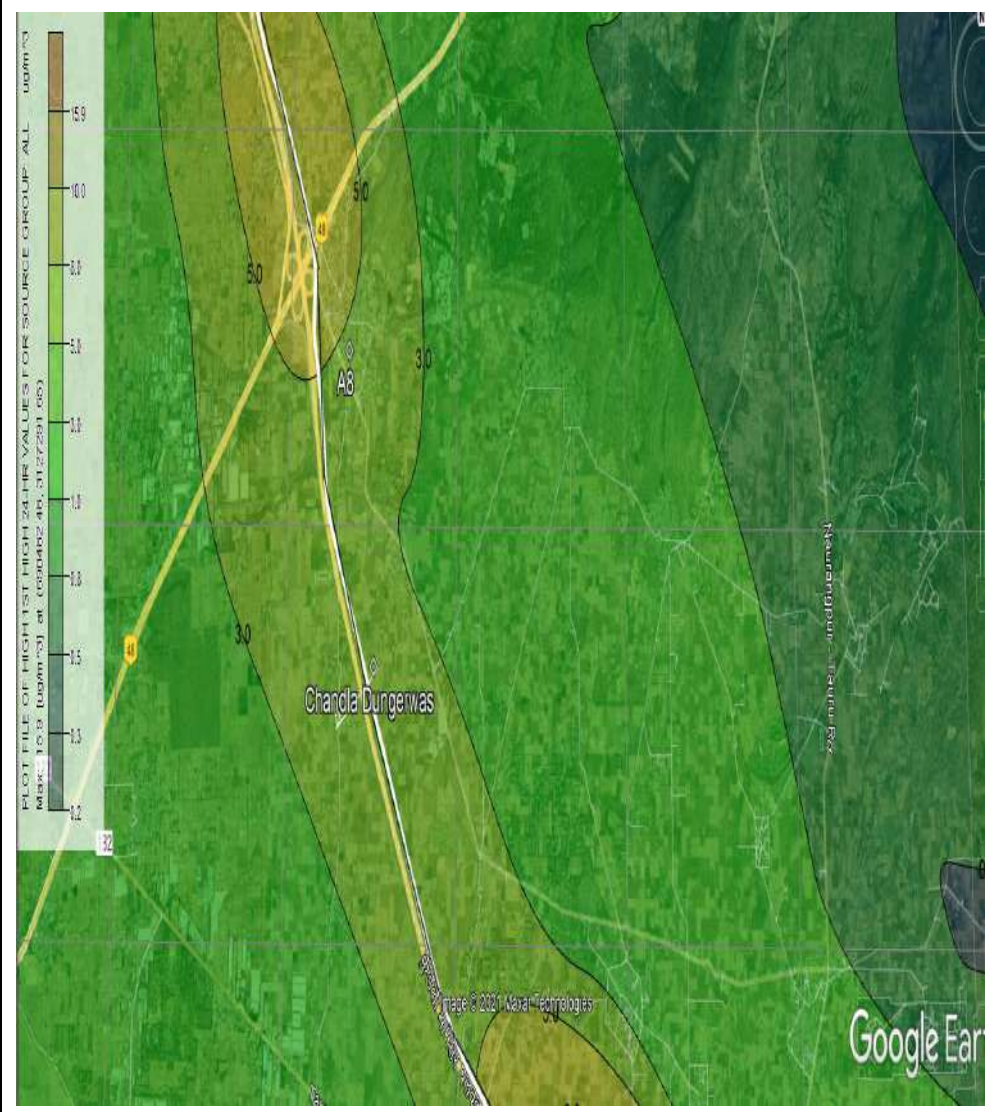
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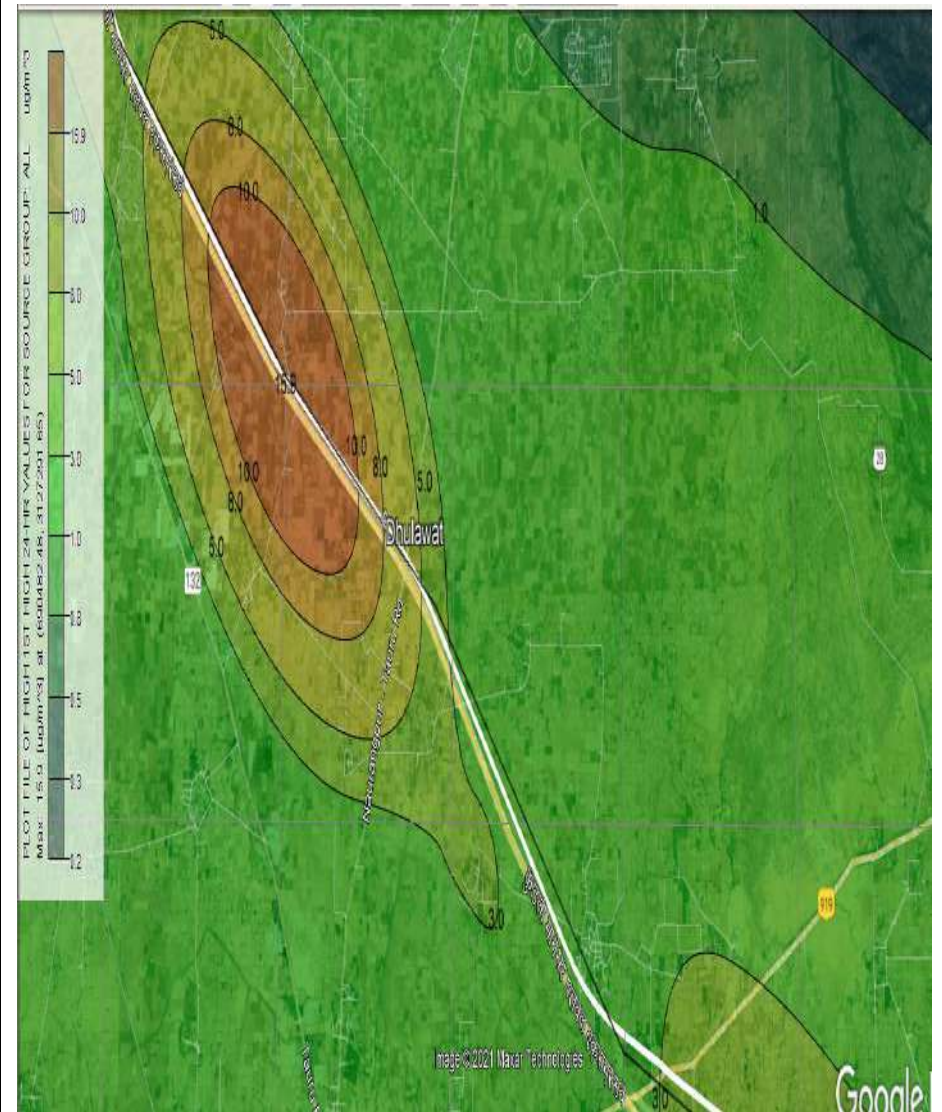
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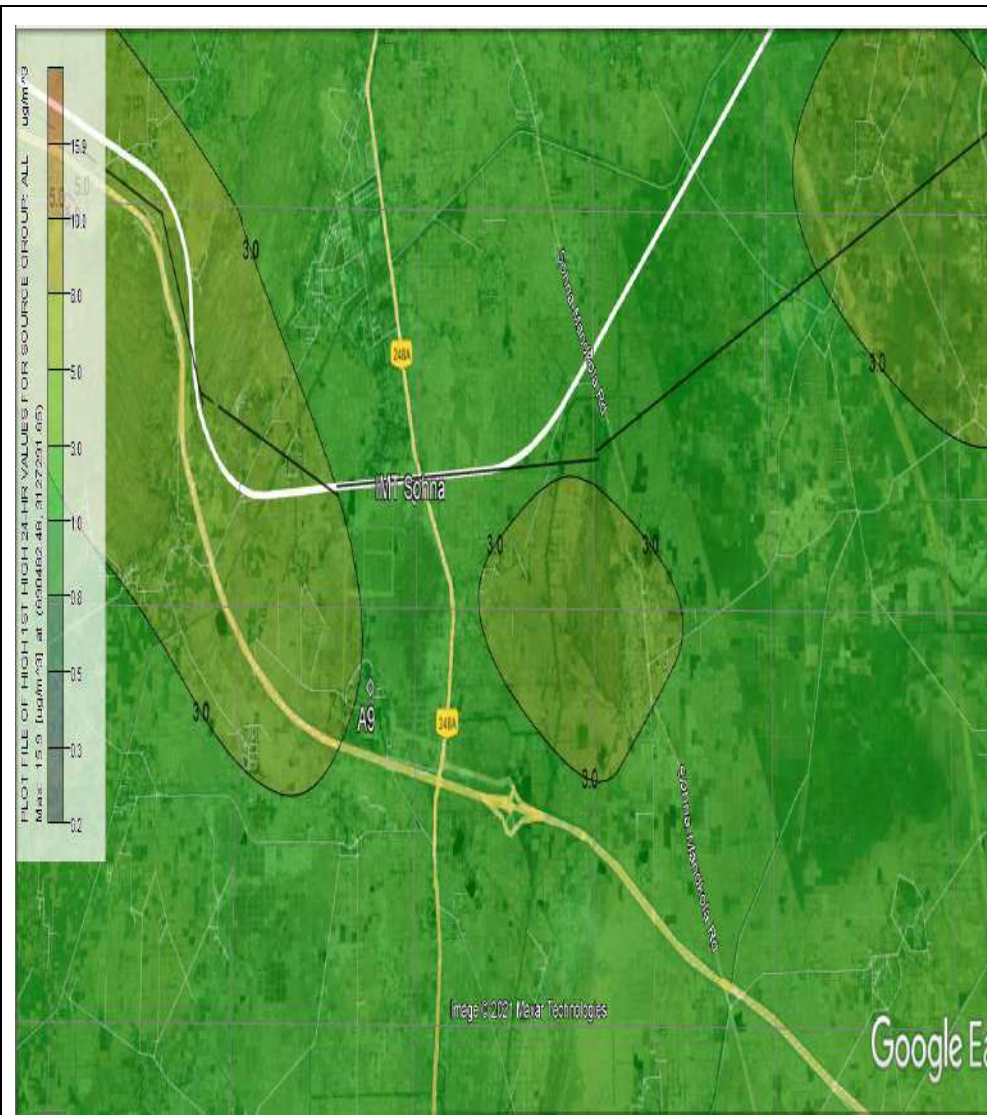
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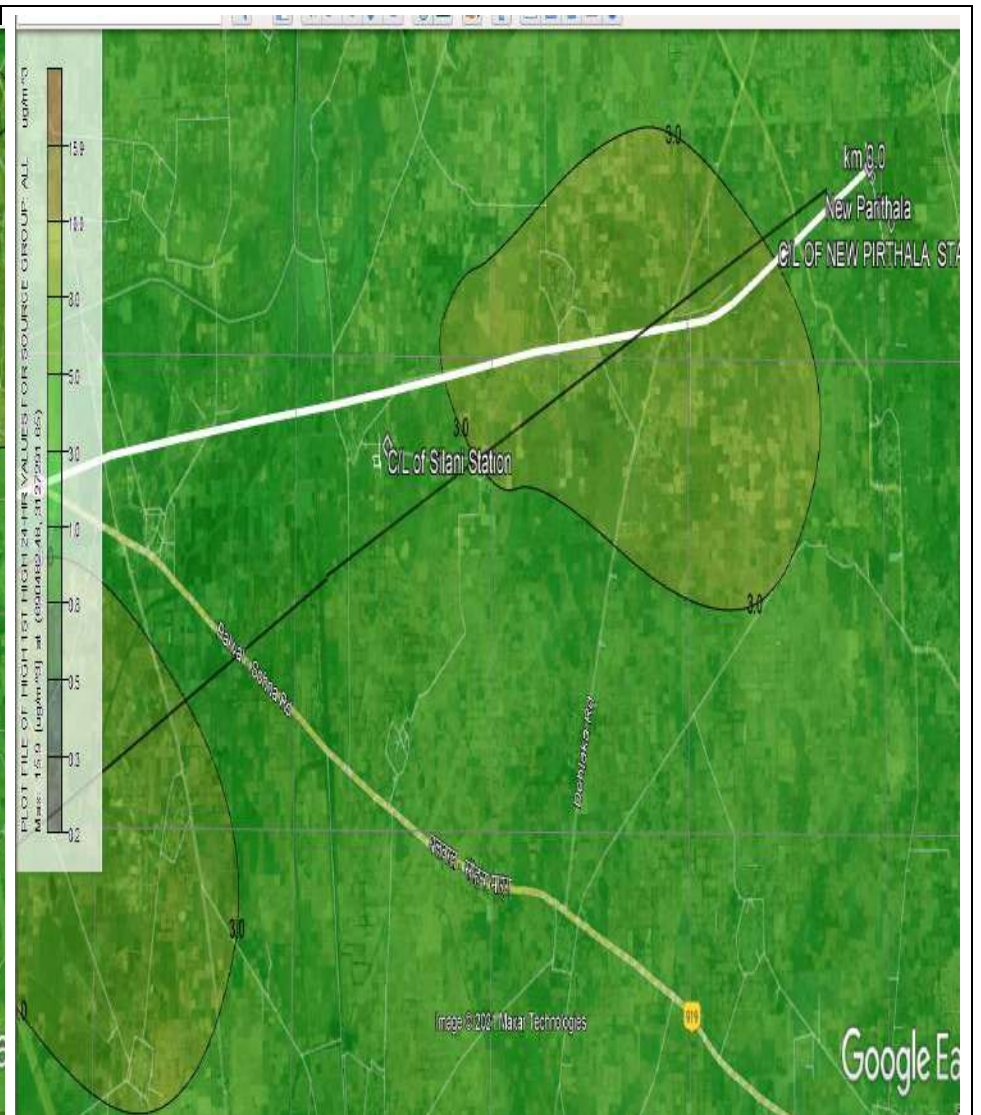
NO₂ INCREMENTAL GLC AT CHANDLA DUNGERWAS STATION LOCATION



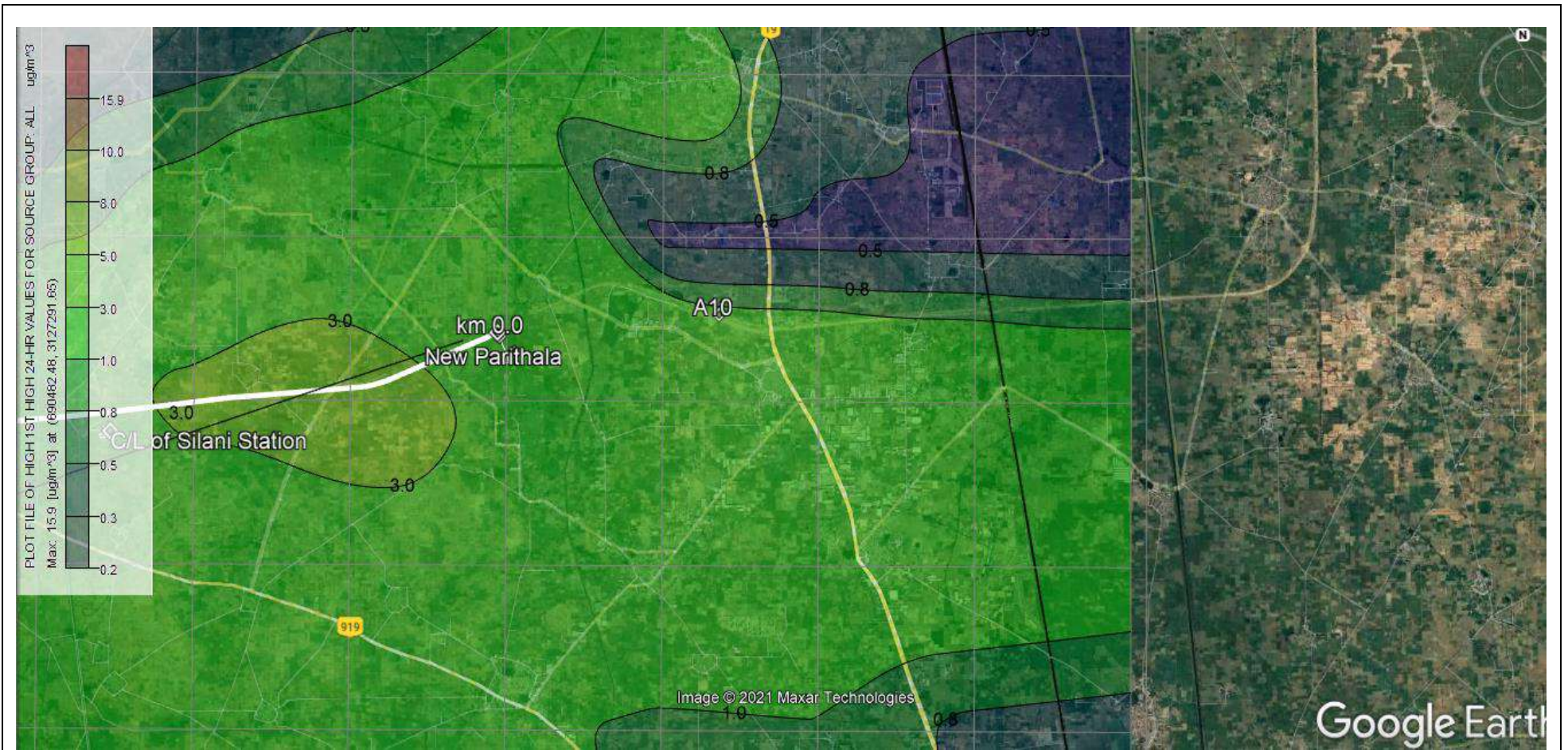
NO₂ INCREMENTAL GLC AT DHULAWAT STATION LOCATION



NO₂ INCREMENTAL GLC AT IMT SOHNA STATION LOCATION

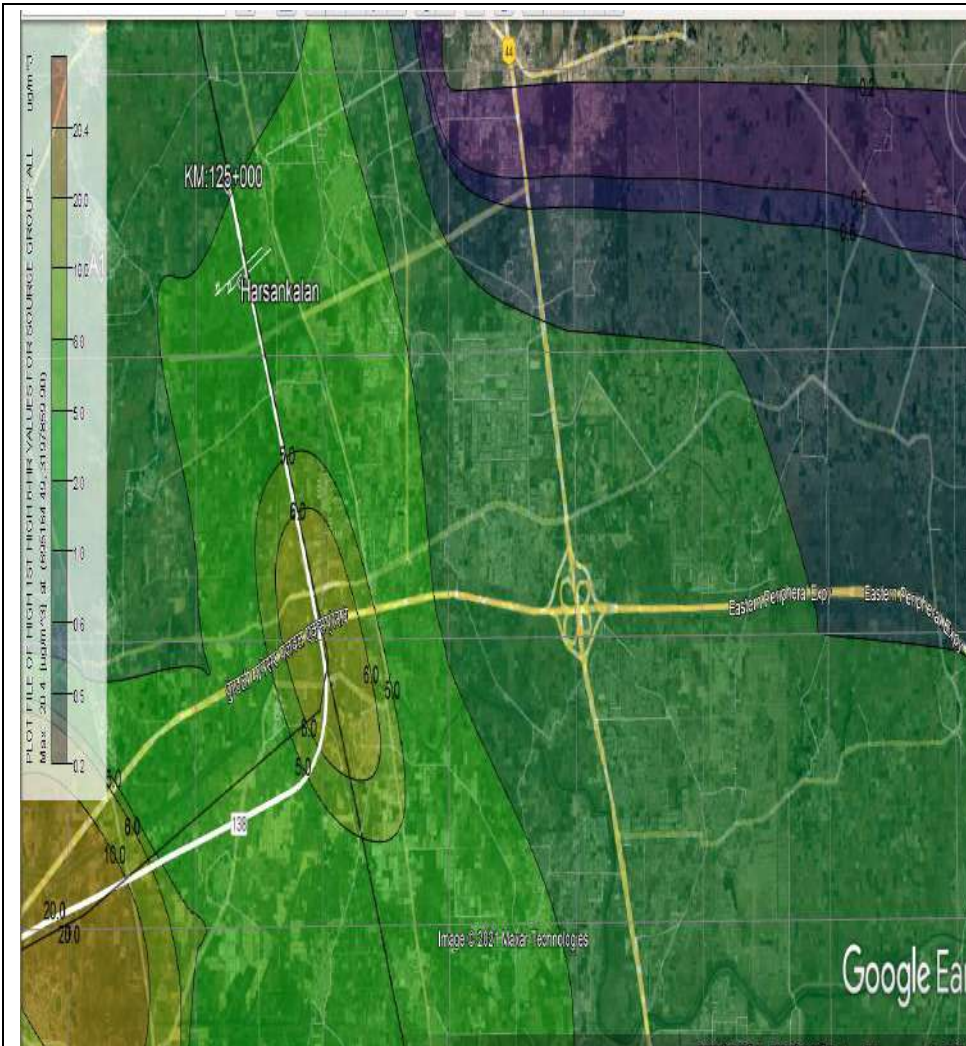


NO₂ INCREMENTAL GLC AT SILANI STATION LOCATION

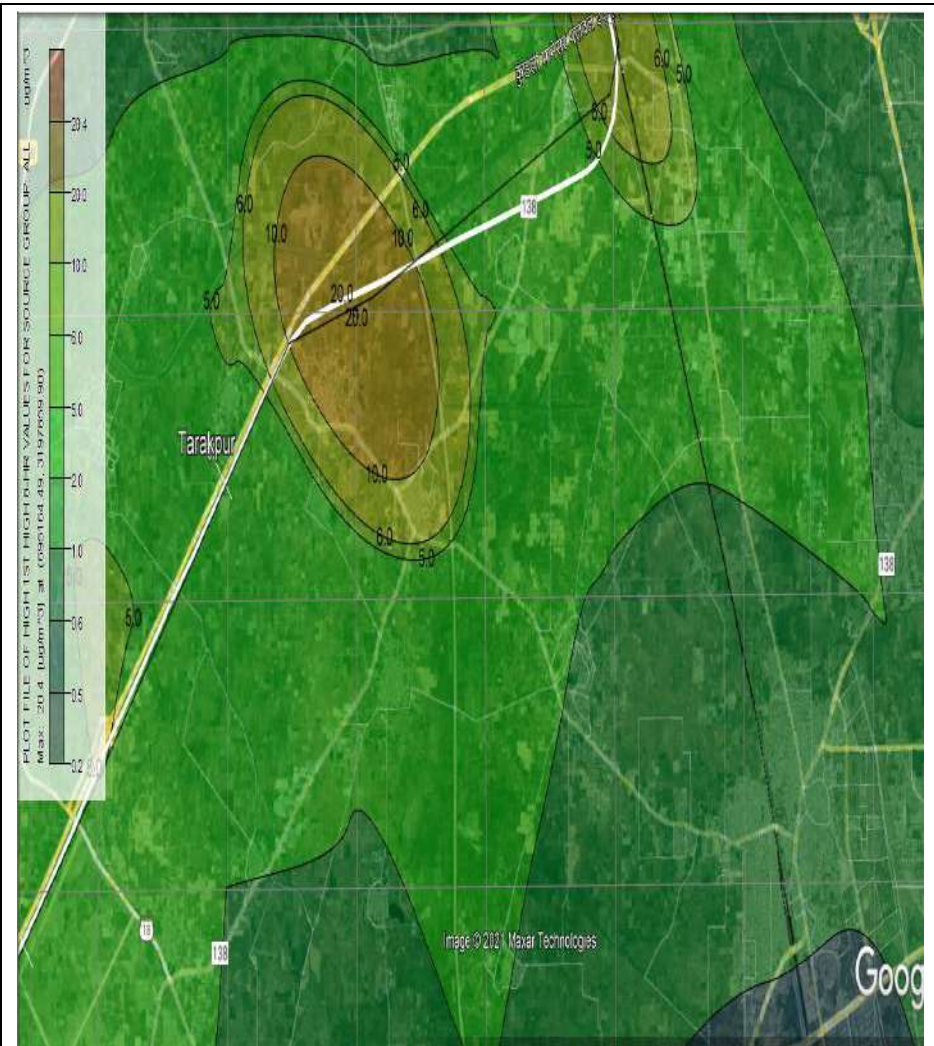


NO₂ INCREMENTAL GLC AT NEW PRITHALA STATION LOCATION

CO INCREMENTAL VALUE FOR INDIVIDUAL STATIONS ARE GIVEN BELOW:



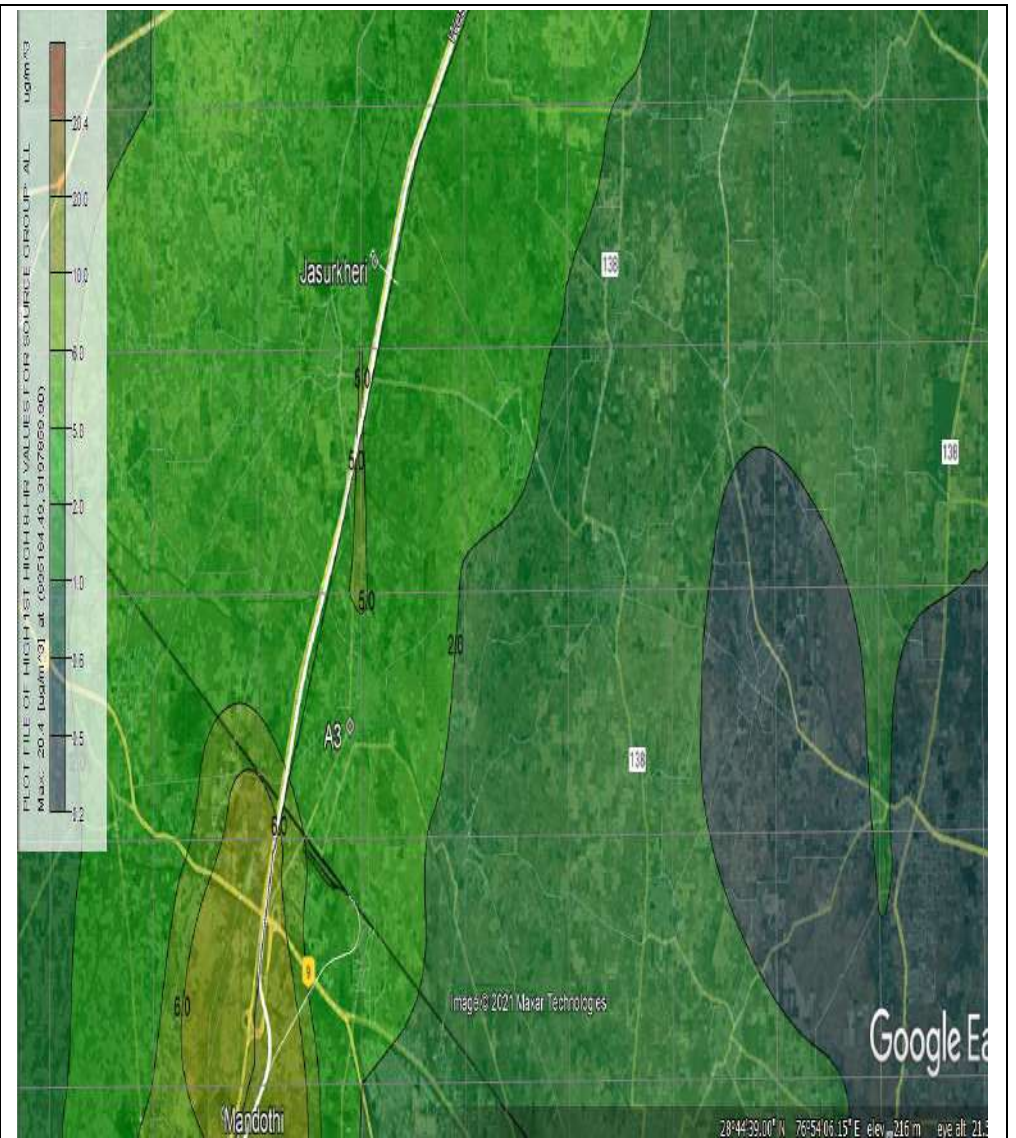
CO INCREMENTAL GLC AT HARSANAKALAN STATION LOCATION



CO INCREMENTAL GLC AT TARAKPUR STATION LOCATION



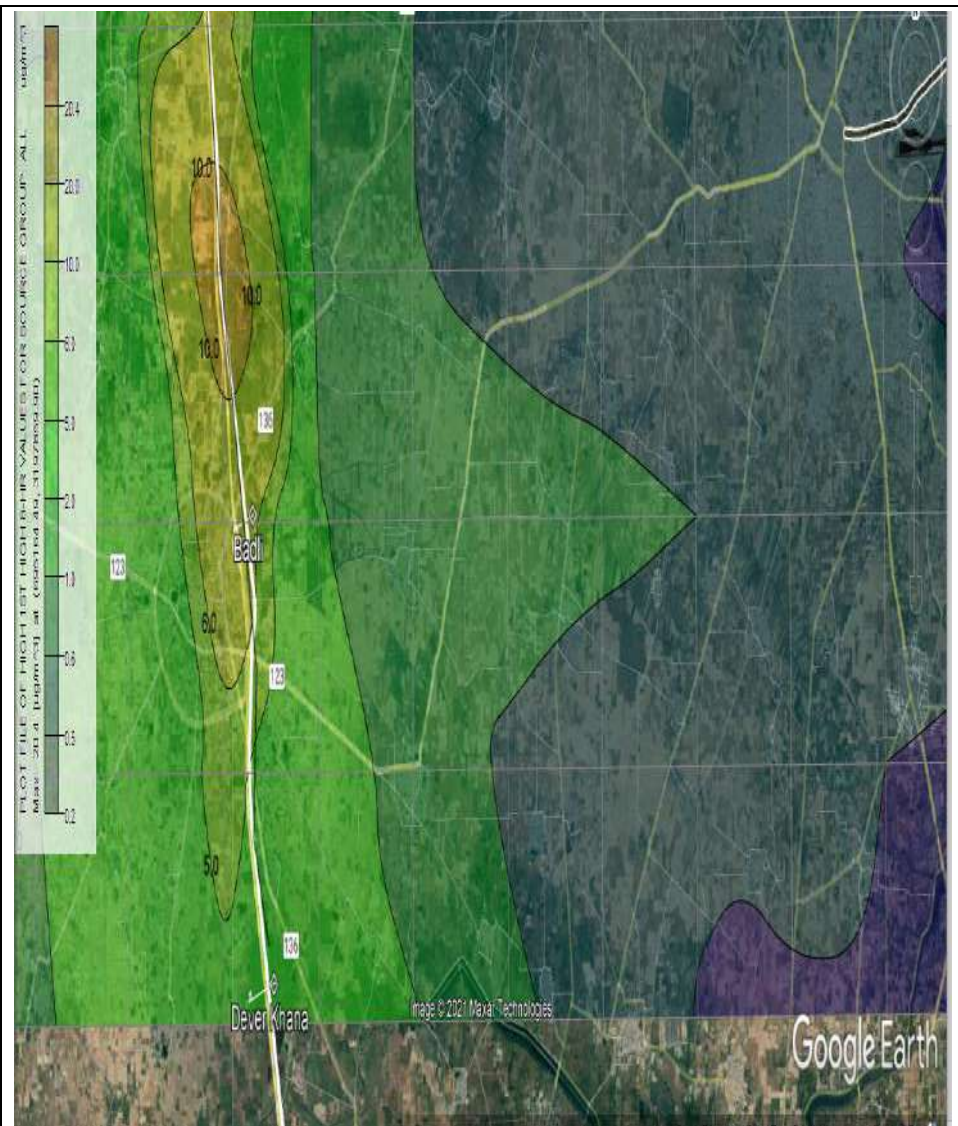
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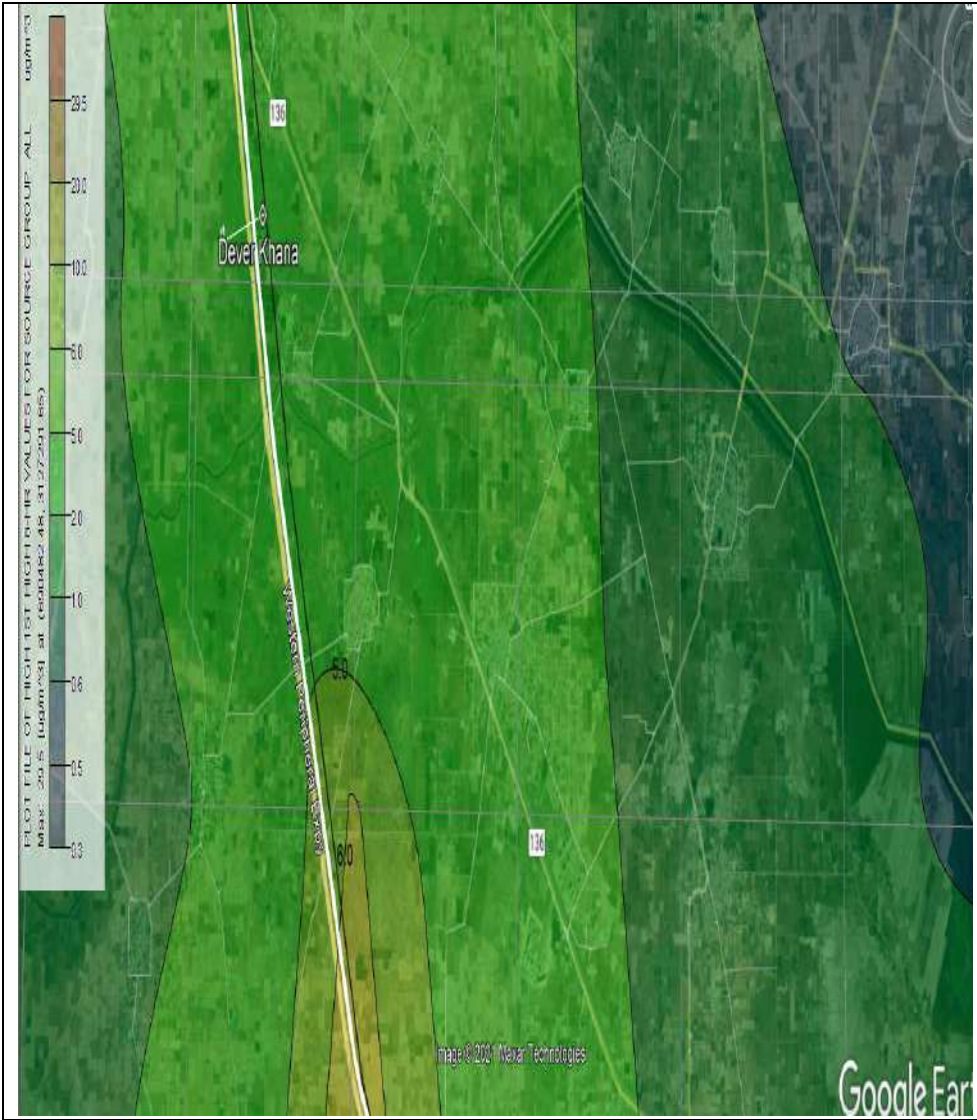
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CO INCREMENTAL GLC AT MANDOTHI STATION LOCATION



CO INCREMENTAL GLC AT BADLI STATION LOCATION



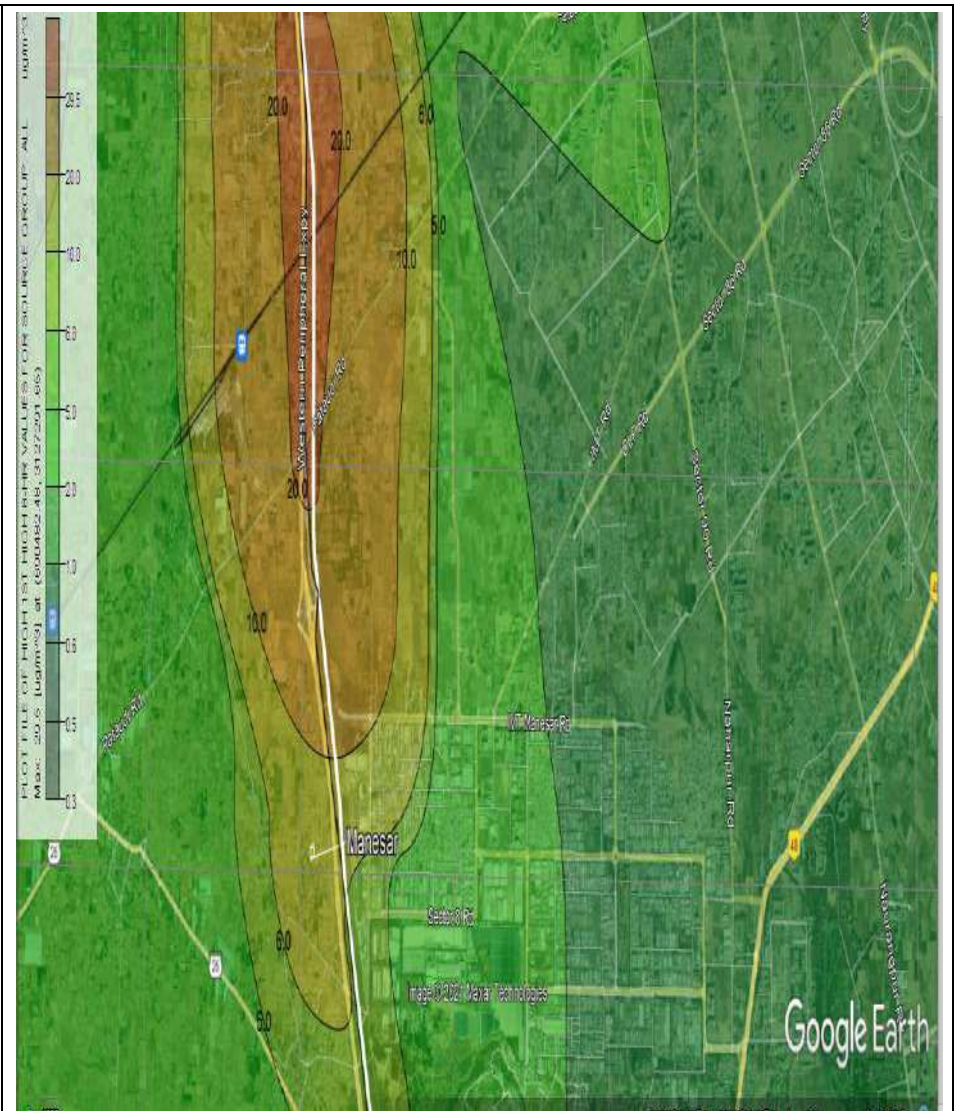
CO INCREMENTAL GLC AT DEVARKHANA STATION LOCATION



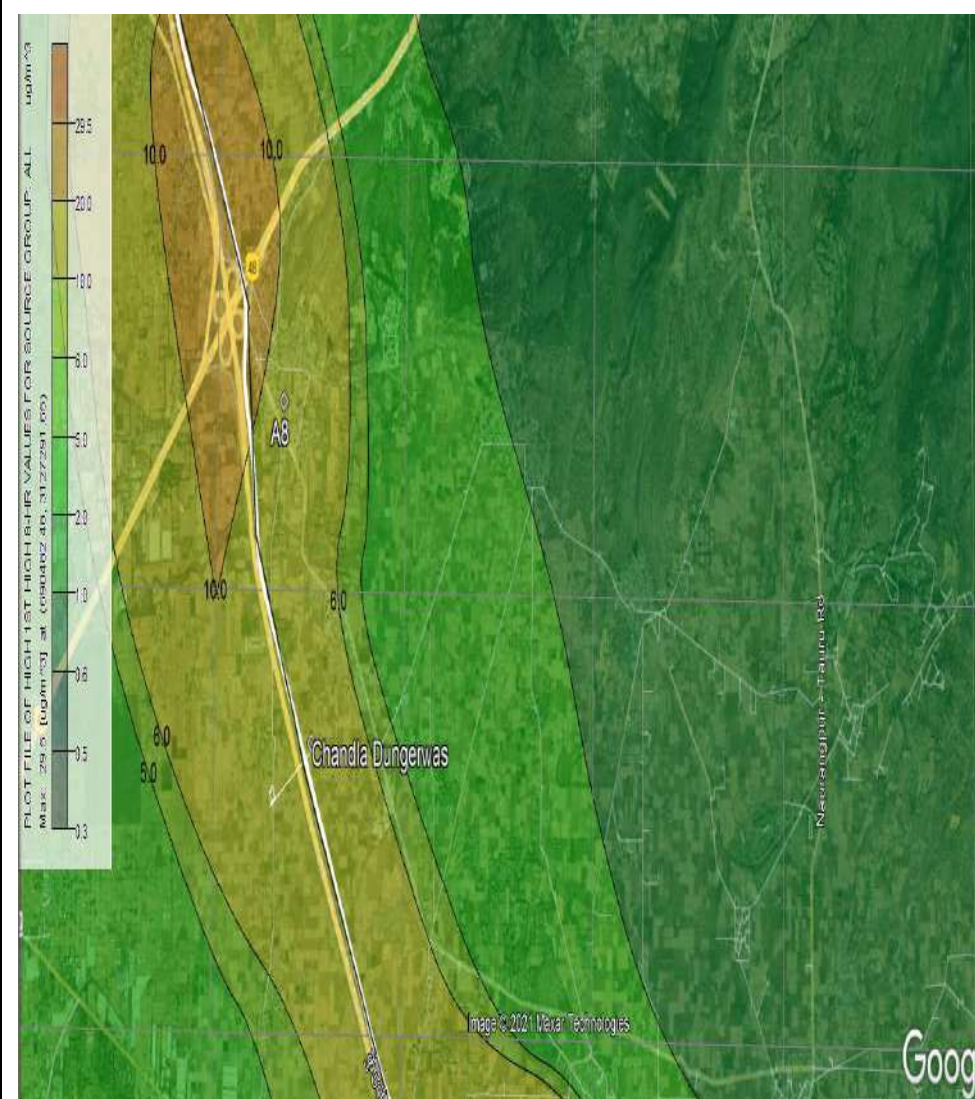
CO INCREMENTAL GLC AT BADSA STATION LOCATION



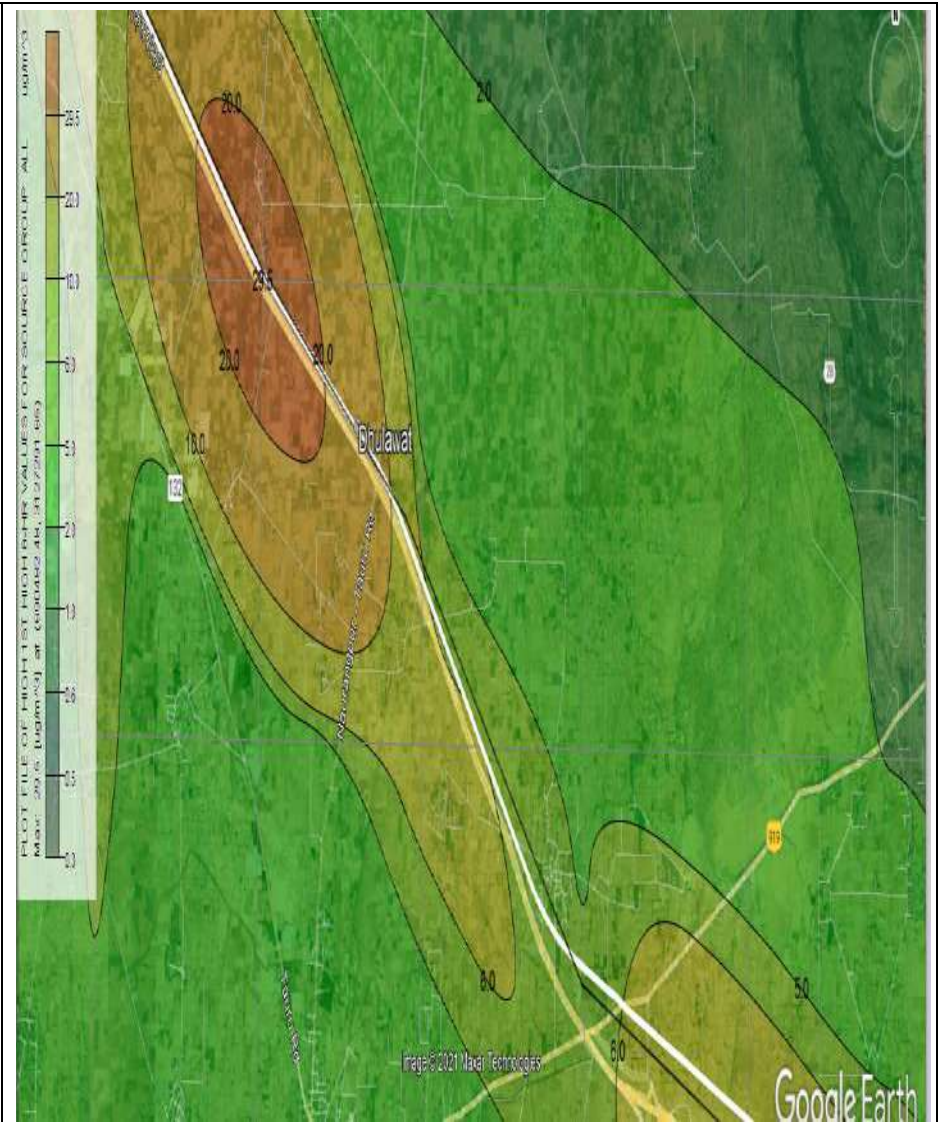
CO INCREMENTAL GLC AT NEW PATLI STATION LOCATION



CO INCREMENTAL GLC AT MANESAR STATION LOCATION



CO INCREMENTAL GLC AT CHANDLA DUNGERWAS STATION LOCATION



CO INCREMENTAL GLC AT DHULAWAT STATION LOCATION



CO INCREMENTAL GLC AT IMT SOHNA STATION LOCATION






CO INCREMENTAL GLC AT SILANI STATION LOCATION









CO INCREMENTAL GLC AT NEW PRITHALA STATION LOCATION

Detail of Structure impacted due to HORC proposed alignment




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1	Palwal	Pirthala	Tubewell With One Room	Pucca	(-)1700	100%	Agriculture Field	Owner	 
2	Palwal	Pirthala	Boundary Wall	Pucca	(-)1400	100%	Agriculture Field	Owner	




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
									
3	Palwal	Pirthala	Bore Well	Semi Pucca	(-)1240	100%	Agriculture Field	Owner	 




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
4	Palwal	Chhaprola	Well	Pucca	(-)900	100%	Agriculture Field	Owner	 
5	Palwal	Chhaprola	Boundary Wall	Semi Pucca	(-)700	50%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
6	Palwal	Chhaprola	Tubewell With One Room	Semi Pucca	120	100%	Agriculture Field	Owner	
7	Palwal	Chhaprola	Tubewell With One Room	Semi Pucca	900	100%	Agriculture Field	Owner	
8	Palwal	Chhaprola	House	Pucca	990	50%	Agriculture Field	Owner	




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
9	Palwal	Paroli	Bore Well	Semi Pucca	3500	80%	Agriculture Field	Owner	
10	Palwal	Paroli	House	Pucca	3850	70%	Agriculture Field	Owner	
11	Gurugram	Ratikan oabad	Borwell With One Room	Semi Pucca	5800	100%	Agriculture Field	Owner	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1	Gurugra	Ratikan	Borwell With One Room	Pucca	6580	80%	Agriculture	Owner	
2	m	oabad					Field		
1	Gurugra	Khuntpu	Borewell With Hut	Semi Pucca	6885	80%	Agriculture	Owner	 
3	m	ri					Field		


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
14	Gurugra	Silani	locl Crossing	Pipe Line	8842	Intercept	locl	locl	 
15	Gurugra	Karanki	Well	Pucca	10450	100%	Agriculture Field	Owner	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 6	Gurugra m	Karanki	Room	Pucca	10480	100%	Agriculture Field	Owner	
1 7	Gurugra m	Karanki	Bhumiya	Semi Pucca	10530	100%	Agriculture Field	Owner	
1 8	Gurugra m	Karanki	Field Boundary (160 Meter)	Semi Pucca	10860	25%	Agriculture Field	Owner	



			Length)						
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S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
19	Gurugra m	Karanki	Boundary Wall	Semi Pucca	11100	50%	Agriculture Field	Owner	
20	Gurugra m	Karanki	2 Borewell With One Room	Semi Pucca	11615	30%	Agriculture Field	Owner	 




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
									
2 1	Gurugra m	Karanki	One Room	Pucca	11700	100%	Agriculture Field	Owner	

2	Nuh	Rewasan	Water Pump With Room	Semi Pucca	20300	100%	Habitation	Owner	
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S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
									
2 3	Nuh	Maraula	Tea Hut	Tempor ay	23450	100%	Agriculture Field	Owner	




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
2 4	Nuh	Maindla	Bore Well	Pucca	28100	100%	Agriculture Field	Owner	
2 5	Nuh	Maindla	Borewell With One Room	Pucca	28175	100%	Agriculture Field	Owner	

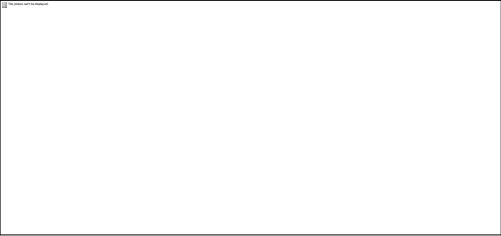

2		Dhulaw					Agriculture		
6	Nuh	at	Two Houses	Pucca	29370	100%	Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
2 7	Nuh	Dhulaw at	Boundary Wall	Semi Pucca	29520	100%	Agriculture Field	Owner	
2 8	Nuh	Dhulaw at	Boundary Wall	Semi Pucca	29600	100%	Agriculture Field	Owner	
2 9	Nuh	Dhulaw at	Agriculture Hut With Borewell	Semi Pucca	29900	100%	Agriculture Field	Owner	

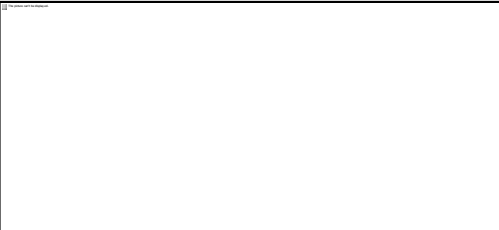

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
									
30	Nuh	Bidhuwas	House	Pucca	30500	100%	Habitation Village Padhani	Owner	
31	Nuh	Bidhuwas	Borewell	Pucca	30660	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
3 2	Nuh	Padheni	Borewell	Pucca	31000(S. M.Chainage ge End)	100%	Agriculture Field	Owner	
3 3	Nuh	Dhulawat	Borewell, One Room	Pucca	30180	100%	Agriculture Field	Owner	
3 4	Nuh	Bidhuwas	Bore Well	Semi Pucca	30300	100%	Agriculture Field	Owner	


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
3 5	Nuh	Bidhuw as	House	Pucca	30370	100%	Agriculture Field	Owner	
3 6	Nuh	Bidhuw as	Two Room	Semi Pucca	30700	100%	Agriculture Field	Owner	
3 7	Nuh	Bidhuw as	Borewell And One Room	Semi Pucca	30800	100%	Agriculture Field	Owner	

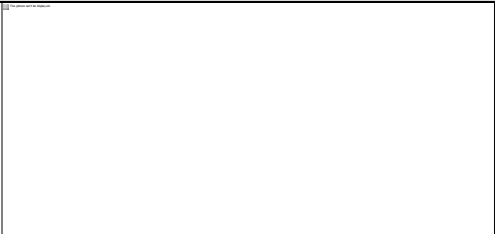

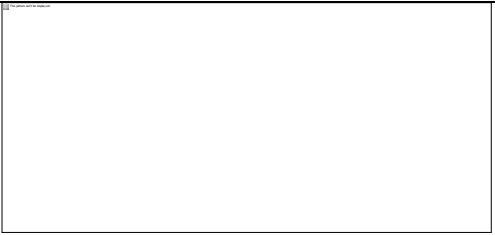
S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
39	Nuh	Padheni	Boundary Wall Of Agriculture Field	Pucca	31400	80%	Agriculture Field	Owner	
40	Nuh	Padheni	Boundary Well (Stone Wall Pucca)	Pucca	31500	100%	Agriculture Field	Owner	

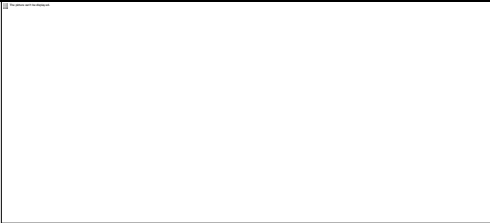
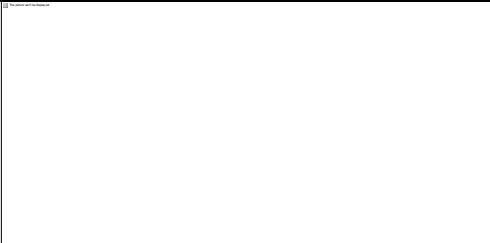
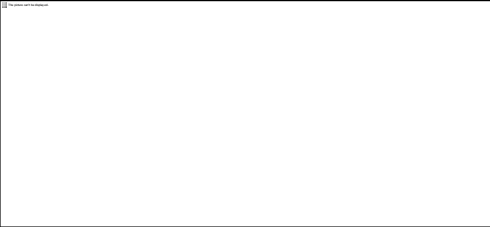
S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
4 2	Nuh	Padheni	Structure House Type	Pucca	32020	100%	Agriculture Field	Owner	
4 3	Nuh	Gogjaka	Bore Well One Kutcha Room	Kuchha	33030	100%	Agriculture Field	Owner	

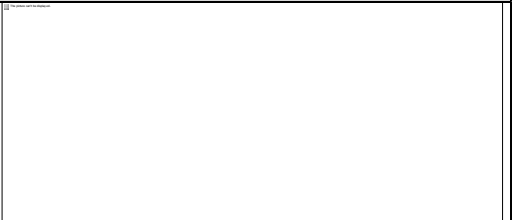


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
4			Bore Well,				Agriculture		
4	Nuh	Gogjaka	Poultry Shade	Pucca	33260	100%	Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
4 6	Nuh	Goela	Bore Well And One Temporary Room	Semi Pucca	33450	100%	Agriculture Field	Owner	
4 7	Nuh	Goela	Bore Well And One Room	Pucca	33700	100%	Agriculture Field	Owner	

4							Agriculture		
8	Nuh	Goela	One Room	Pucca	33900	100%	Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
49	Nuh	Goela	Two Room,Bore Well	Pucca	34450	100%	Agriculture Field	Owner	
50	Nuh	Deengar heri	Borewell And One Room	Pucca	35130	100%	Agriculture Field	Owner	
51	Nuh	Deengar heri	Borewell And One Room	Pucca	35740	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
5 2	Nuh	Deengar heri	Borewell And One Room	Semi Pucca	35820	80%	Agriculture Field	Owner	
5 3	Nuh	Deengar heri	Borewell	Pucca	36080	100%	Agriculture Field	Owner	
5 4	Nuh	Deengar heri	House , Poultry	Semi Pucca	36160	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
5	Nuh	Deengar	Borewell	Pucca	36275	100%	Agriculture	Owner	
5		heri					Field		
5	Nuh	Sabras	Bore Well	Semi	37130	100%	Agriculture	Owner	
6			One Room	Pucca			Field		
5	Nuh	Sabras	Bore Well	Pucca	37275	100%	Agriculture	Owner	
7			One Room				Field		

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
5 8	Nuh	Sabras	Room	Semi Pucca	37800	100%	Agriculture Field	Owner	
5 9	Nuh	Sabras	Bore Well One Room	Semi Pucca	38200	100%	Agriculture Field	Owner	
6 0	Nuh	Sabras	House In Ag. Field	Pucca	38400 To 38460	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
									<div style="border: 1px solid black; height: 150px; width: 100%;"></div> <div style="border: 1px solid black; height: 150px; width: 100%;"></div>
6 2	Nuh	Sabras	Bore Well	Pucca	39300	100%	Agriculture Field	Owner	<div style="border: 1px solid black; height: 150px; width: 100%;"></div>

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
6 3	Nuh	Sabras	Bore Well	Pucca	39400	100%	Agriculture Field	Owner	
6 4	Nuh	Sabras	Wine Shop	Temporary	39400	100%	Agriculture Field		
6 5	Nuh	Sabras	House In Ag. Field	Semi Pucca	39620	100%	Agriculture Field	Owner	

					39270				
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6	Nuh	Sabras	Rooms + Under Constructed	Semi Pucca	39620	100%	Agriculture Field	Owner	
7			Swimming						

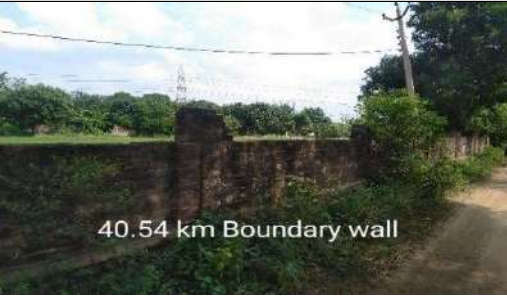

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
			Pool						
6 8	Nuh	Sabras	Dhaba	Semi Pucca	39620	100%	Agriculture Field	Owner	
6 9	Nuh	Sabras	Bore Well One Room	Semi Pucca	39770	100%	Agriculture Field	Owner	


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
70	Nuh	Sabras	Gaushala	Teen Shade Semi Pucca	40150	25%	Agriculture Field	Owner	<div data-bbox="1398 402 1902 678"></div> <div data-bbox="1398 768 1902 1036"></div>

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
7 1	Gurugram	Udepuri	Farm House Boundary	Semi Pucca	40250	50%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
7 2	Gurugra m	Udepuri	Ofc Cable		40300	100%			
7 3	Gurugra m	Udepuri	House And Bore Well	Pucca	40460	50%	Agriculture Field	Owner	

7	Gurugra		Boundary	Semi			Agriculture		
4	m	Udepuri	Wall	Pucca	40530	50%	Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
									
7 5	Gurugram	Udepuri	House	Pucca	40520	100%	Habitation	Owner	


					40700					
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S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
									
7 6	Gurugra m	Udepuri	Industry	Pucca	40680	30%	Industrial Area	Owner	
7 7	Gurugra m	Udepuri	House	Pucca	40730	100%	Habitation	Owner	


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
7 8	Gurugra m	Langra	Temp. Structure	Kuchha	41360	100%	Barren Area	Owner	
7 9	Gurugra m	Langra	Boundary Wall	Pucca	41940 To 41970	40%	Industry	Owner	
8 0	Gurugra m	Langra	Teen Shade	Semi Pucca	41950	40%	Industry	Owner	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
81	Gurugram	Bhaghanki	Boundary Wall	Semi Pucca	42250	100%	Habitation	Owner	 41.95 Km Boundary wall and House
82	Gurugram	Chandla Dungarwas	Bore Well	Pucca	42500	100%	Agriculture Field	Owner	 Appx 42.5km Borewell
8	Gurugram	Chandla Dungarwas	Boundary Wall	Pucca	42600	50%	Agriculture Field	Owner	 Appx 42.6km Boundary wall


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
84	Gurugram	Chandlas	Bore Well And One Room	Semi Pucca	42970	100%	Agriculture Field	Owner	 <p>42.9 km Borewell and Room</p>
85	Gurugram	Chandlas	Bore Well And One Room	Pucca	43230	100%	Agriculture Field	Owner	 <p>Appx 43.23 km Borewell and Room</p>


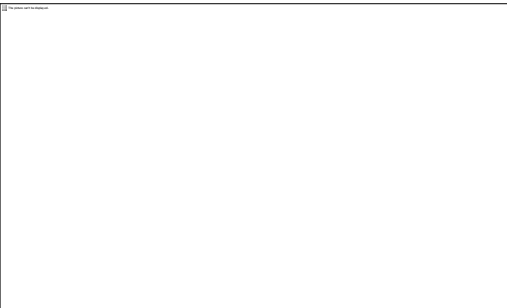
8	Gurugra	Chandla Dungarwa	Closed	Semi			Agriculture		
6	m	s	Gaushala	Pucca	43460	100%	Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
87	Gurugram	Chandla Dungarwas	Smadhi	Pucca	43900	100%	Agriculture Field	Owner	 <p>Appx 43.93km Smadhi</p>
88	Gurugram	Chandla Dungarwas	Bore Well And One Room	Semi Pucca	43930	100%	Agriculture Field	Owner	 <p>Appx 43.93 km Borewell and Room</p>

8	Gurugra	Chandla					Agriculture		
9	m	Dungarwa	Borewell	Pucca	44000	100%	Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
90	Gurugram	Chandlas	Smadhi	Pucca	44000	100%	Agriculture Field	Owner	
91	Gurugram	Chandlas	One Room	Pucca	44000	100%	Agriculture Field	Owner	

9	Gurugra	Fazalwa								
2	m	s	House	Pucca	44900	50%	Habitation	Owner		

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
93	Gurugram	Fazalwas	Bore Well And Houses (3)	Pucca	45000 To 45100	70%	Agriculture Field	Owner	 

9	Gurugra	Fazalwa		Semi						
4	m	s	Teen Shade	Pucca	45216	100%	Habitation	Owner		

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
95	Gurugram	Kukrola	Bore Well And One Room	Semi Pucca	45750	100%	Agriculture Field	Owner	  
9	Gurugram	Kukrola	Bore Well	Pucca	45800	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
97	Gurugram	Kasan	House	Pucca	49100	100%	Agriculture Field	Owner	
98	Gurugram	Baslambi	Horse Farm	Pucca	50800	100%		Owner	
99	Gurugram	Kasan	Room	Pucca	50850	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
100	Gurugram	Kasan	Boundary Wall	Semi Pucca	50315 51300	30%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 02	Gurugram	Dhanka	House	Semi Pucca	52880	100%	Habitation	Owner	
1 03	Gurugram	Dhanka		Semi Pucca	53030	100%	Agriculture Field	Owner	

			Bore Well And One Room						
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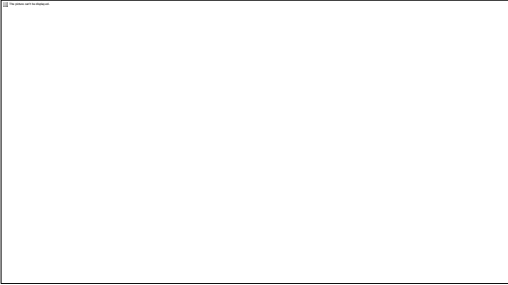
S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 04	Gurugra m	Dhanka	Room	Pucca	53100	100%	Agriculture Field	Owner	
1 05	Gurugra m	Basharia	Bore Well And One Room	Semi Pucca	53330	100%	Agriculture Field	Owner	

1 06	Gurugra m	Patli Hajipur	One Room	Semi Pucca	54250	100%	Agriculture Field	Owner	
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S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 07	Gurugra m	Patli Hajipur	Bore Well And One Room	Semi Pucca	54630	100%	Agriculture Field	Owner	
1 08	Gurugra m	Patli Hajipur	Bore Well	Pucca	55430	100%	Agriculture Field	Owner	

1	Gurugra	Patli	Bore Well				Agriculture		
09	m	Hajipur	And Room	Pucca	55700	100%	Field	Owner	




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1	Gurugram	Patli Hajipur	Ice Factory	Pucca	55980	100%	Habitation	Owner	<div style="border: 1px solid black; height: 150px; width: 100%;"></div> <div style="border: 1px solid black; height: 150px; width: 100%;"></div>



1	Gurugra	Patli	Teen Shade	Semi			Agriculture		
11	m	Hajipur	Dairy	Pucca	56150	100%	Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1	Jhajjar	Lagarpu r	Pond	Artificial Structure	70+350	40%	Land Plot	Owner	
1	Jhajjar	Badli	Kothri	Semi- Pucca	71+950	100%	Private Plot	Owner	

1 14	Jhajjar	Badli	Pipe Line (2.0 M Dia)	Pucca	73+250	Na	Government	Govern ment	
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S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
15	Jhajjar	Daryapur	Kothri	Semi-Pucca	73+300	100%	Private Plot	Owner	
16	Jhajjar	Daryapur	Temple	Pucca	73+400	100%	Private	Owner	
17	Jhajjar	Daryapur	Moter Service Center	Artificial Structure	73+400	100%	Land Plot	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
18	Jhajjar	Daryapur	Kothri	Pucca	73+850	100%	Owner	Owner	
19	Jhajjar	Badli	Police Station	Pucca	74+300	100%	Government	Government	
20	Jhajjar	Badli	Rooms(Commercial)	Pucca	75+390	100%	Private	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 21	Jhajjar	Badli	Pond	Artificial Structure	76+200- 76+350	50%	Land Plot	Owner	
1 22	Jhajjar	Badli	Pond	Artificial Structure	76+600- 76+750	50%	Land Plot	Owner	
1 23	Jhajjar	Badli	Kothri	Pucca	77+650	100%	Owner	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 24	Jhajjar	Bupania	Indian Oil Petrol Pump	Pucca	80+400	50%	Government	Private	
1 25	Jhajjar	Bupania	Pipe Line (0.6 M Dia)	Pucca	82+950	Na	Government	Govern ment	
1 26	Jhajjar	Bupania	Canal	Govern ment	83+000	Na	Government	Govern ment	


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 27	Jhajjar	Dabodha Khurd	Temple	Pucca	84+500	100%	Private Plot	Owner	
1 28	Jhajjar	Dabodha Khurd	Dhram Kanta(Weighing Station)	Pucca	84+550	100%	Private Plot	Owner	
1 29	Jhajjar	Dabodha Khurd	Home	Semi-Pucca	84+570	100%	Habitation	Owner	


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 30	Jhajjar	Dabodh a Khurd	Boundary Wall	Pucca	85+000	100%	Agriculture Field	Owner	
1 31	Jhajjar	Dabodh a Khurd	Pond	Artificial Structure	85+550	100%	Land Plot	Owner	
1 32	Jhajjar	Mehand ipur	Tube Well	Pucca	87+700	100%	Agriculture Field	Owner	




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1	Jhajjar	Mandot	Bore Well (3	Pucca	89+300-	100%	Agriculture	Owner	
33		hi	No.)		89+400				
1	Jhajjar	Mandot	Pond	Artificial	89+700	50%	Land Plot	Owner	
34		hi		Structure					
1	Jhajjar	Mandot	House	Semi-	93+250	50%	Agriculture	Tenant	
35		hi	Pucca	Field					

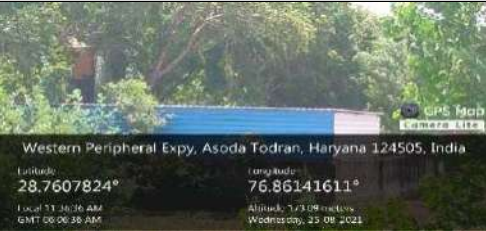

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 36	Jhajjar	Mandot hi	Canal	Govern ment	93+400	Na	Agriculture Field	Govern ment	
1 37	Jhajjar	Asaudha Todran	Solid Waste Factory	Pucca	93+600	100%	Agriculture Field	Leasse d	
1 38	Jhajjar	Asaudha Todran	Factory(Co mmercial)	Pucca	94+100	100%	Agriculture Field	Leasse d	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 39	Jhajjar	Asaudha Todran	Tube Well	Pucca	94+250	100%	Agriculture Field	Owner	
1 40	Jhajjar	Asaudha Todran	Room	Pucca	94+900	100%	Agriculture Field	Owner	
1 41	Jhajjar	Asaudha Todran	Canal	Govern ment	95+050	Na	Na	Govern ment	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 42	Jhajjar	Asaudha Todran	Tube Well	Pucca	95+900	100%	Agriculture Field	Owner	
1 43	Jhajjar	Asaudha Todran	Well	Pucca	96+250	100%	Agriculture Field	Owner	


1 44	Jhajjar	Asaudha Todran	Room Closet (Agri- Field)	Pucca	96+300	100%	Agriculture Field	Owner	 <p> <small> Pwani - Ne phani - sopy - A local - house, Rajmala 154666, mlu Longitude: 28.755816° Latitude: 76.857688° UTM: YQW045, 581101.249, 543084, 18722107, 4, 1000, 383, 1000 </small> </p>
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S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 45	Jhajjar	Asaudha Todran	House	Pucca	96+300	50%	Habitation	Owner	 <p>Western Peripheral Expy, Asoda Todran, Haryana, India Latitude: 28.755816° Longitude: 76.887888° LOCAL TIME: 01:06:49 PM GMT+05:30 SATURDAY, 22 SEP 2021 ALT: 106.167 meter</p>
1 46	Jhajjar	Asaudha Todran	Bore Well	Pucca	96+300	100%	Agriculture Field	Owner	 <p>GPS Map Camera Lite Western Peripheral Expy, Asoda Todran, Haryana 124505, India Latitude: 28.75586179° Longitude: 76.85831343° Local Time: 04:34 AM Altitude: 174.79 meters GMT: 05:49:34 AM Wednesday, 25 08 2021</p>
1 47	Jhajjar	Asaudha Todran	Canal	Govern ment	96+700	100%	Na	Govern ment	 <p>Western Peripheral Expy, Asoda, Haryana, India Latitude: 28.759782° Longitude: 76.860745° LOCAL TIME: 01:06:49 PM GMT+05:30 SATURDAY, 22 SEP 2021 ALT: 106.167 meter</p>

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 48	Jhajjar	Asaudha Todran	Home	Pucca	97+100	20%	Agriculture Field	Owner	
1 49	Jhajjar	Asaudha Todran	Well	Pucca	97+300	100%	Agriculture Field	Owner	
1 50	Jhajjar	Asaudha Todran	Bore Well	Pucca	97+700	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 51	Jhajjar	Asaudha Todran	Private School	Pucca	98+000	50%	Private Plot	Owner	
1 52	Jhajjar	Asaudha Todran	Petrol Pump	Pucca	98+200	30%	Road Side Land	Leased	




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 53	Jhajjar	Jasour Kheri	Tube Well	Pucca	98+350	100%	Agriculture Field	Owner	
1 54	Jhajjar	Jasour Kheri	Tube Well	Pucca	98+380	100%	Agriculture Field	Owner	




1 55	Jhajjar	Jasour Kheri	Shop (Tubewell)	Semi- Pucca	99+350	100%	Agriculture Field	Owner	 <p data-bbox="1398 423 1902 480"> <small> 1. Name of the land/property: Jasour, Haryana-166500, India Pincode: 28.779607, Longitude: 76.872748 UTM: 12.509, 497.064841, 5491041.642402, 49.1186, 125.0618 </small> </p>
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S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 56	Jhajjar	Jasour Kheri	Tube Well	Pucca	99+350	100%	Agriculture Field	Owner	 A photograph showing a concrete tube well structure in a green agricultural field. The structure has a vertical pipe and a small concrete base. The background shows trees and a clear sky. A semi-transparent text overlay at the bottom of the image reads: "Western Himalayas, Jasour, Kheri, Haryana, India. Lat: 28.779607° Longitude: 76.872748° LOCAL TIME: GMT+05:30 DATE: 02/25/2021 ALTITUDE: 155 METERS".
1 57	Jhajjar	Jasour Kheri	Canal	Govern ment	99+950	Na	Agriculture Field	Govern ment	 A photograph of a narrow canal or irrigation channel cutting through a rural landscape. The canal is bordered by concrete or stone walls. The surrounding area is green with fields and trees. A semi-transparent text overlay at the bottom of the image reads: "Western Himalayas, Jasour, Kheri, Haryana, India. Lat: 28.784623° Longitude: 76.875563° LOCAL TIME: GMT+05:30 DATE: 02/20/2021 ALTITUDE: 186 METERS".

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 59	Jhajjar	Kheri Jasour	Bore Well	Pucca	100+150	100%	Agriculture Field	Owner	
1 60	Jhajjar	Kheri Jasour	Bore Well	Pucca	100+250	100%	Agriculture Field	Owner	
1 61	Jhajjar	Kheri Jasour	Bore Well	Pucca	100+300	100%	Agriculture Field	Owner	




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 62	Jhajjar	Kheri Jasour	Kothri	Pucca	100+900	100%	Agriculture Field	Owner	
1 63	Jhajjar	Kheri Jasour	Bore Well	Pucca	100+900	100%	Agriculture Field	Owner	
1 64	Jhajjar	Kheri Jasour	Tower	Pucca	100+950	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 65	Jhajjar	Nilothi	Tube Well	Pucca	101+800	100%	Agriculture Field	Owner	
1 66	Jhajjar	Nilothi	Bore Well	Pucca	101+950	100%	Agriculture Field	Owner	
1 67	Sonipat	Kirauli	Well	Pucca	102+900	100%	Agriculture Field	Owner	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 68	Sonipat	Kirauli	Canal	Pucca	102+900	100%	Government	Owner	
1 69	Sonipat	Kirauli	Tubewell	Pucca	103+200	100%	Agriculture Field	Owner	
1 70	Sonipat	Pai	Kothri	Semi- Pucca	104+900	100%	Agriculture Field	Owner	


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 71	Sonipat	Pipli	House	Pucca	110+450	100%	Agriculture	Owner	
1 72	Sonipat	Pipli	Tube Well	Pucca	110+450	100%	Agriculture	Owner	
1 73	Sonipat	Pipli	Tube Well	Pucca	110+500	100%	Agriculture	Owner	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 74	Sonipat	Pipli	Tube Well	Pucca	110+530	100%	Agriculture Field	Owner	
1 75	Sonipat	Pipli	Tube Well	Pucca	110+600	100%	Agriculture Field	Owner	
1 76	Sonipat	Pipli	Tube Well	Pucca	111+900	100%	Agriculture Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 77	Sonipat	Thana Kalan	Tube Well	Pucca	112+800	100%	Agriculture Field	Owner	
1 78	Sonipat	Thana Kalan	Tube Well	Pucca	113+000	100%	Agriculture Field	Owner	
1 79	Sonipat	Thana Kalan	Tube Well	Pucca	113+000	100%	Agriculture Field	Owner	


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 81	Sonipat	Mandori	Kothri	Pucca	114+850	100%	Agriculture Field	Owner	
1 82	Sonipat		Tube Well	Pucca	115+550	100%	Agriculture Field	Owner	
1 83	Sonipat		Bore Well	Pucca	115+900	100%	Agriculture Field	Owner	




S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 85	Sonipat		Tube Well	Pucca	116+000	100%	Agriculture Field	Owner	
1 87	Sonipat	Mandora	Kothri	Pucca	116+150	100%	Agriculture Field	Owner	



1		Mandor					Agriculture		
88	Sonipat	a	Bore Well	Pucca	116+250	100%	Field	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 89	Sonipat	Mandor a	Tube Well	Pucca	116+350	100%	Agriculture Field	Owner	
1 90	Sonipat	Mandor a	Tube Well	Pucca	116+950	100%	Agriculture Field	Owner	
1 91	Sonipat	Mandor a	Tube Well	Pucca	117+000	100%	Agriculture Field	Owner	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 92	Sonipat	Mandor a	Kothri	Pucca	117+350	100%	Agriculture Field	Owner	
1 93	Sonipat	Mandor a	Tube Well	Pucca	117+350	100%	Agriculture Field	Owner	
1 94	Sonipat	Mandor a	Tube Well	Pucca	118+500	100%	Agriculture Field	Owner	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 95	Sonipat	Mandor a	Tube Well	Pucca	118+550	100%	Agriculture Field	Owner	
1 96	Sonipat	Mandor a	Kothri	Pucca	118+700	100%	Agriculture Field	Owner	
1 97	Sonipat	Mandor a	Tube Well	Pucca	118+700	100%	Agriculture Field	Owner	


S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
1 98	Sonipat	Mandora	Hodi	Temporary	118+700	100%	Agriculture Field	Owner	
1 99	Sonipat	Mandora	Pond	Artificial Structure	118+700 -118+800	100%	Land Plot	Owner	
2 00	Sonipat	Mandora	Kothri	Pucca	118+850	100%	Agriculture Field	Owner	



S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
2 01	Sonipat	Mahla Majra	Kothri	Pucca	119+850	100%	Agriculture Field	Owner	
2 02	Sonipat	Mahla Majra	Tube Well	Pucca	119+850	100%	Agriculture Field	Owner	

2		Mahla		Semi-						
03	Sonipat	Majra	Commercial	Pucca	120+550	100%	Land Plot	Owner		

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
2 04	Sonipat	Akbarpur Barota	Kothri	Pucca	122+600	100%	Land Plot	Owner	
2 05	Sonipat	Jagdishpur	Temple	Pucca	126+000	100%	Land Plot	Owner	

S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
2 06	Sonipat	Harsana Kalan	Temple	Pucca	127+650	100%	Land Plot	Owner	
2 07			Kothri	Semi-Pucca	3+690 (Asaudah Connectivity)	100%	Land Plot	Owner	

2 08			Kothri	Pucca	3+690 (Asaudah Connectivi ty)	100%	Land Plot	Owner	
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S. No.	District	Village	Structure Name	Structure Type	Chainage (M)	Part Affected	Owner	Owner / Tennant	Photographs
209			Rcc Shed(Commercial)	Pucca	3+690 (Asaudah Connectivity)	50%	Land Plot	Owner	 <p>GPS Map Camera Lite</p> <p>Unnamed Road, Chhatera Bahadurpur, Haryana 131103, India</p> <p>Latitude: 28.72962898° Longitude: 76.87032908°</p> <p>Local: 11:05:30 AM Altitude: 165.8 meters GMT: 05:38:30 AM Friday, 27/08/2021</p>
210			Room(Commercial)	Pucca	3+550 (Asaudah Connectivity)	100%	Land Plot	Owner	 <p>GPS Map Camera Lite</p> <p>Unnamed Road, Chhatera Bahadurpur, Haryana 131103, India</p> <p>Latitude: 28.72786191° Longitude: 76.86926179°</p> <p>Local: 11:18:27 AM Altitude: 164.57 meters GMT: 05:48:27 AM Friday, 27/08/2021</p>

Annexure 5.5**Detail of CPR impacted due to proposed HORC project**

Name of District	Name of Tehsil	Name of Village	Name of CPRs	Number	Extent of Impact (%)
Palwal	Palwal	Prithla-42	-	-	-
		Chhaprola-4	-	-	-
		Dehlaka	-	-	-
		Paroli	-	-	-
Gurugram	Sohna	Ratikanoabad	-	-	-
		Khuntpuri	-	-	-
		Silani	-	-	-
		Karanki	Bhumiya	1	100
Nuh	Nuh	Bhirawati	-	-	-
Gurugram	Sohna	Sancholi	-	-	-
Nuh	Nuh	Atta	-	-	-
		Indri	-	-	-
		Khanpur	-	-	-
		Kherli Kankar	-	-	-
		Rupaheri	-	-	-
		Rojka Meo	-	-	-
	Tauru	Sehsaula	-	-	-
		Maindla	-	-	-
		Dhulawat	-	-	-
		Bidhuwas	-	-	-
		Padheni	-	-	-
		Gogjaka	-	-	-
		Goela	-	-	-

Name of District	Name of Tehsil	Name of Village	Name of CPRs	Number	Extent of Impact (%)
		Deengarheri	-	-	-
		Sabras	-	-	-
		Kalwari	-	-	-
Gurugram	Manesar	Udepuri	-	-	-
		Chandla Dungarwas	Smadhi	2	100
		Fazalwas	-	-	-
		Kukrola	-	-	-
		Fakharpur	-	-	-
		Kasan	-	-	-
		Mokalwas	-	-	-
		Kasan	-	-	-
	F. Nagar	Jhund Sarai Abad	-	-	-
		Patli Hajipur	-	-	-
		Khentawas	-	-	-
		Sultanpur	-	-	-

Name of District	Name of Tehsil	Name of Village	Name of CPRs	Number	Extent of Impact (%)
		Jhanjrola	-	-	-
		Mubarikpur	-	-	-
Jhajjar	Badli	Mundakhera	-	-	-
		Ismilpur	-	-	-
		Dewarkhana	-	-	-
		Lagarpur	-	-	-
		Badli	-	-	-
		Daryapur	Temple	1	100
		Badli	-	-	-
		Majri	-	-	-
		Bahadurgarh	Bupania	-	-
	Dabodha Khurd		Temple	1	100
	Mehandipur		-	-	-
	Mandothi		-	-	-
	Jakhoda		-	-	-
	Asaudha Todran		School	1	50
	Jasour Kheri		-	-	-
	Kheri Jasour		-	-	-
	Nilothi		-	-	-
		Kharkhoda	Kirauli	-	-
Pai			-	-	-
Prahladpur			-	-	-
Barona			-	-	-
Gopalpur			-	-	-
Pipli			-	-	-
Thana Kalan			-	-	-
Turakpur			-	-	-

Sonipat		Turakpur	-	-	-
		Mandora	-	-	-
	Sonipat	Nahra	-	-	-
		Mahla Majra	-	-	-
		Chhatehra Bhadurpur	-	-	-
		Mahla Majra	-	-	-
	Rai	Akbarpur Barota	-	-	-
	Sonipat	Jagdishpur	Temple	1	100
		Nasirpur Bangar	Temple	1	100
		Harsana Khurd	-	-	-
		Harsana Kalan	-	-	-

Annexure 5.6

S. No.	District	Private Land (in Hectare)	Land Breakup as per Kharif crop production in 2020-2021					Kharif Crop Production as per Kg/Hectare					Kharif Crop Cost as per MSP 2020-2021				
			Rice (49%)	Bajra (23%)	Cotton (24%)	Jowar (3%)	Pulses (1%)	Rice	Bajra	Cotton	Jowar	Pulses	Rice	Bajra	Cotton	Jowar	Pulses
1	Palwal	15.74483	7.7150	3.6213	3.7788	0.4723	0.1574	4058	2611	0	472	0	7661641	5613575	0	1237544	0
2	Gurugram	112.21018	54.9830	25.8083	26.9304	3.3663	1.1221	0	12698	0	3366	0	0	27300064	0	8819720	0
3	Jhajjar	99.50480	48.7574	22.8861	23.8812	2.9851	0.9950	111459	12702	0	2985	1284	210435167	27308843	0	7821077	8213833
4	Sonipat	81.10463	39.7413	18.6541	19.4651	2.4331	0.8110	17486	15446	16798	2433	0	33013868	33207968	97850632	6374824	0
5	Nuh	151.60016	74.2841	34.8680	36.3840	4.5480	1.5160	0	20119	0	4548	0	0	43255542	0	11915772	0
Total		460.1646	225.4808	105.8378	110.4395	13.8048	4.6015	133003	63576	16798	13804	1284	251110676	136685992	97850632	36168937	8213833

District – wise cost for Rabi crop

S. No.	District	Private Land (in Hectare)	Land Breakup as per Rabi crop production in 2020-2021				Rabi Crop Production as per Kg/Hectare				Rabi Crop Cost as per MSP 2020-2021			
			Wheat (79%)	Rapeseed & Mustard (17%)	Gram (3%)	Barley (1%)	Wheat	Rapeseed & Mustard	Gram	Barley	Wheat	Rapeseed & Mustard	Gram	Barley
1	Pawal	15.74483	12.4384	2.6766	0.4723	0.1574	64431	1172	0	348	127251214	5451474	0	556737
2	Gurugram	112.21018	88.6460	19.0757	3.3663	1.1221	459187	2537	0	612	906893352	11797386	0	978473
3	Jhajjar	99.50480	78.6088	16.9158	2.9851	0.9950	407194	10809	3851	405	804207230	50262809	19639262	647975
4	Sonipat	81.10463	64.0727	13.7878	2.4331	0.8110	331896	19661	0	0	655495355	91425442	0	0
5	Nuh	151.60016	119.7641	25.7720	4.5480	1.5160	620378	6830	0	3276	1225246867	31757580	0	5241727
Total		460.1646	363.53	78.2279	13.8048	4.6015	1883086	41009	3851	4641	3719094018	190694691	19639262	7424912

Village – wise cost for Kharif crops

S. No.	District	Village	Private Land (in Hectare)	Land Breakup as per Kharif crop production in 2020-2021					Kharif Crop Production as per Kg/Hectare					Kharif Crop Cost as per MSP 2020-2021				
				Rice (49%)	Bajra (23%)	Cotton (24%)	Jowar (3%)	Pulses (1%)	Rice	Bajra	Cotton	Jowar	Pulses	Rice	Bajra	Cotton	Jowar	Pulses
1		Prithla	0.46792	0.2293	0.1076	0.1123	0.0140	0.0047	121	78	0	14	0	227695	166829	0	36778	0

S. No.	District	Village	Private Land (in Hectare)	Land Breakup as per Kharif crop production in 2020-2021					Kharif Crop Production as per Kg/Hectare					Kharif Crop Cost as per MSP 2020-2021				
				Rice (49%)	Bajra (23%)	Cotton (24%)	Jowar (3%)	Pulses (1%)	Rice	Bajra	Cotton	Jowar	Pulses	Rice	Bajra	Cotton	Jowar	Pulses
2	Palwal	Chhaprola	10.87848	5.3305	2.5020	2.6108	0.3264	0.1088	2804	1804	0	326	0	5293609	3878552	0	855048	0
3	Palwal	Kalwaka	1.67439	0.8205	0.3851	0.4019	0.0502	0.0167	432	278	0	50	0	814780	596978	0	131607	0
4		Dehlaka	0.25546	0.1252	0.0588	0.0613	0.0077	0.0026	66	42	0	8	0	124309	91080	0	20079	0
5		Paroli	2.46859	1.2096	0.5678	0.5925	0.0741	0.0247	636	409	0	74	0	1201247	880136	0	194031	0
Total			15.74483	7.7150	3.6213	3.7788	0.4723	0.1574	4058	2611	0	472	0	7661641	5613575	0	1237544	0
6	Palwal	Ratikanoabad	2.93398	1.4376	0.6748	0.7042	0.0880	0.0293	0	332	0	88	0	0	713819	0	230611	0
7		Khuntपुरी	4.25932	2.0871	0.9796	1.0222	0.1278	0.0426	0	482	0	128	0	0	1036267	0	334783	0
8		Silani	6.38393	3.1281	1.4683	1.5321	0.1915	0.0638	0	722	0	192	0	0	1553171	0	501777	0
9		Karanki	5.07883	2.4886	1.1681	1.2189	0.1524	0.0508	0	575	0	152	0	0	1235649	0	399196	0
10		Sancholi	4.72218	2.3139	1.0861	1.1333	0.1417	0.0472	0	534	0	142	0	0	1148879	0	371164	0

S. No.	District	Village	Private Land (in Hectare)	Land Breakup as per Kharif crop production in 2020-2021					Kharif Crop Production as per Kg/Hectare					Kharif Crop Cost as per MSP 2020-2021					
				Rice (49%)	Bajra (23%)	Cotton (24%)	Jowar (3%)	Pulses (1%)	Rice	Bajra	Cotton	Jowar	Pulses	Rice	Bajra	Cotton	Jowar	Pulses	
12	Gurugram	Langra	3.73824	1.8317	0.8598	0.8972	0.1121	0.0374	0	423	0	112	0	0	909492	0	293826	0	
13		Bhaghanki	1.18118	0.5788	0.2717	0.2835	0.0354	0.0118	0	134	0	35	0	0	287374	0	92841	0	
14		Chandla Dungarwas	9.02959	4.4245	2.0768	2.1671	0.2709	0.0903	0	1022	0	271	0	0	2196844	0	709726	0	
15		Fazalwas	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	0
16		Kukrola	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	0
17		Fakharpur	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	0
18		Mokalwas	1.68198	0.8242	0.3869	0.4037	0.0505	0.0168	0	190	0	50	0	0	409215	0	132203	0	
19		Kasan	5.03604	2.4677	1.1583	1.2086	0.1511	0.0504	0	570	0	151	0	0	1225237	0	395832	0	
20		Baslambi	0.00759	0.0037	0.0017	0.0018	0.0002	0.0001	0	1	0	0	0	0	1846	0	596	0	
21		Dhana	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	0
22		Basharia	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	0
23		Babra Bakipur	0.63991	0.3136	0.1472	0.1536	0.0192	0.0064	0	72	0	19	0	0	155686	0	50297	0	
24		Jhund Sarai Abad	1.12304	0.5503	0.2583	0.2695	0.0337	0.0112	0	127	0	34	0	0	273228	0	88271	0	
25		Patli Hajipur	21.58495	10.5766	4.9645	5.1804	0.6475	0.2158	0	2443	0	648	0	0	5251488	0	1696577	0	
26		Khentawas	4.16068	2.0387	0.9570	0.9986	0.1248	0.0416	0	471	0	125	0	0	1012269	0	327030	0	
27		Saidpur Mohammadpur	8.72859	4.2770	2.0076	2.0949	0.2619	0.0873	0	988	0	262	0	0	2123614	0	686067	0	
28		Jhanjrola	7.33239	3.5929	1.6864	1.7598	0.2200	0.0733	0	830	0	220	0	0	1783926	0	576326	0	
29		Mubarikpur	3.42229	1.6769	0.7871	0.8214	0.1027	0.0342	0	387	0	103	0	0	832623	0	268992	0	
30		Sultanpur	21.16549	10.3711	4.8681	5.0797	0.6350	0.2117	0	2395	0	635	0	0	5149436	0	1663607	0	
Total			112.21018	54.9830	25.8083	26.9304	3.3663	1.1221	0	12698	0	3366	0	0	27300064	0	8819720	0	
31		Badsa	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	
32		Mundakhera	7.95715	3.8990	1.8301	1.9097	0.2387	0.0796	8913	1016	0	239	103	16827967	2183819	0	625432	656839	
33		Ismilpur	1.94502	0.9531	0.4474	0.4668	0.0584	0.0195	2179	248	0	58	25	4113384	533807	0	152879	160556	
34		Dewarkhana	0.50333	0.2466	0.1158	0.1208	0.0151	0.0050	564	64	0	15	6	1064452	138137	0	39562	41548	
35		Lagarpur	6.62168	3.2446	1.5230	1.5892	0.1987	0.0662	7417	845	0	199	85	14003692	1817304	0	520464	546601	
36		Daryapur	5.53409	2.7117	1.2728	1.3282	0.1660	0.0553	6199	706	0	166	71	11703621	1518816	0	434979	456823	
37		Badli	24.79210	12.1481	5.7022	5.9501	0.7438	0.2479	27771	3165	0	744	320	52430937	6804130	0	1948659	2046516	
38		Majri	2.30924	1.1315	0.5311	0.5542	0.0693	0.0231	2587	295	0	69	30	4883641	633766	0	181506	190621	

S. No.	District	Village	Private Land (in Hectare)	Land Breakup as per Kharif crop production in 2020-2021					Kharif Crop Production as per Kg/Hectare					Kharif Crop Cost as per MSP 2020-2021				
				Rice (49%)	Bajra (23%)	Cotton (24%)	Jowar (3%)	Pulses (1%)	Rice	Bajra	Cotton	Jowar	Pulses	Rice	Bajra	Cotton	Jowar	Pulses
39	Jhajjar	Gubhana	2.42559	1.1885	0.5579	0.5821	0.0728	0.0243	2717	310	0	73	31	5129695	665697	0	190651	200225
40		Bupania	14.53836	7.1238	3.3438	3.4892	0.4362	0.1454	16285	1856	0	436	188	30746075	3990016	0	1142715	1200099
41		Dabodha khurd	3.88246	1.9024	0.8930	0.9318	0.1165	0.0388	4349	496	0	116	50	8210721	1065531	0	305161	320486
42		Mehandipur	5.62514	2.7563	1.2938	1.3500	0.1688	0.0563	6301	718	0	169	73	11896185	1543806	0	442136	464339
43		Jasour kheri	4.87141	2.3870	1.1204	1.1691	0.1461	0.0487	5457	622	0	146	63	10302182	1336947	0	382893	402121
44		Kheri jasour	6.43957	3.1554	1.4811	1.5455	0.1932	0.0644	7213	822	0	193	83	13618564	1767325	0	506150	531568
45		Nilothi	4.59825	2.2531	1.0576	1.1036	0.1379	0.0460	5151	587	0	138	59	9724489	1261978	0	361422	379572
46		Jakhoda	7.46141	3.6561	1.7161	1.7907	0.2238	0.0746	8358	952	0	224	96	15779562	2047764	0	586466	615917
47	Mandothi	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	
48	Asaudha todran	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	
Total			99.50480	48.7574	22.8861	23.8812	2.9851	0.9950	111459	12702	0	2985	1284	210435167	27308843	0	7821077	8213833
49		Kirauli	4.34110	2.1271	0.9985	1.0419	0.1302	0.0434	936	827	899	130	0	1767059	1777448	5237430	341211	0
50		Pai	6.79676	3.3304	1.5633	1.6312	0.2039	0.0680	1465	1294	1408	204	0	2766642	2782908	8200119.4	534226	0
51		Prahladpur	1.87673	0.9196	0.4316	0.4504	0.0563	0.0188	405	357	389	56	0	763929	768421	2264229.8	147511	0
52		Barona	0.78661	0.3854	0.1809	0.1888	0.0236	0.0079	170	150	163	24	0	320191	322074	949024	61827	0
53		Gopalpur	0.53635	0.2628	0.1234	0.1287	0.0161	0.0054	116	102	111	16	0	218323	219606	647092	42157	0
54		Pipli	7.17054	3.5136	1.6492	1.7209	0.2151	0.0717	1546	1366	1485	215	0	2918787	2935948	8651067	563604	0
55		Thana kalan	6.32575	3.0996	1.4549	1.5182	0.1898	0.0633	1364	1205	1310	190	0	2574916	2590055	7631858	497204	0
56		Turakpur	7.53026	3.6898	1.7320	1.8073	0.2259	0.0753	1624	1434	1560	226	0	3065213	3083234	9085061	591878	0
57		Mandori	2.65070	1.2988	0.6097	0.6362	0.0795	0.0265	571	505	549	80	0	1078973	1085317	3197996	208345	0

S. No.	District	Village	Private Land (in Hectare)	Land Breakup as per Kharif crop production in 2020-2021					Kharif Crop Production as per Kg/Hectare					Kharif Crop Cost as per MSP 2020-2021				
				Rice (49%)	Bajra (23%)	Cotton (24%)	Jowar (3%)	Pulses (1%)	Rice	Bajra	Cotton	Jowar	Pulses	Rice	Bajra	Cotton	Jowar	Pulses
58	Sonipat	Mandora	17.37116	8.5119	3.9954	4.1691	0.5211	0.1737	3745	3308	3598	521	0	7070981	7112554	20957857	1365373	0
59		Nahra	3.91534	1.9185	0.9005	0.9397	0.1175	0.0392	844	746	811	117	0	1593750	1603121	4723757	307746	0
60		Mahla Majra	9.37861	4.5955	2.1571	2.2509	0.2814	0.0938	2022	1786	1942	281	0	3817588	3840033	11315046	737159	0
61		Chhatehra Bhadurpur	7.46141	3.6561	1.7161	1.7907	0.2238	0.0746	1609	1421	1545	224	0	3037186	3055043	9001992	586466	0
62		Jagdishpur	1.11120	0.5445	0.2556	0.2667	0.0333	0.0111	240	212	230	33	0	452317	454977	1340635	87340	0
63		Nasirpur Bangar	0.00253	0.0012	0.0006	0.0006	0.0001	0.0000	1	0	1	0	0	1030	1036	3052	199	0
64		Harsana Khurd	0.27063	0.1326	0.0622	0.0650	0.0081	0.0027	58	52	56	8	0	110162	110810	326513	21272	0
65		Harsana Kalan	0.34904	0.1710	0.0803	0.0838	0.0105	0.0035	75	66	72	10	0	142079	142914	421110	27435	0
66		Akbarpur Barota	3.22990	1.5827	0.7429	0.7752	0.0969	0.0323	696	615	669	97	0	1314741	1322471	3896794.4	253870	0
Total			81.10463	39.7413	18.6541	19.4651	2.4331	0.8110	17486	15446	16798	2433	0	33013868	33207968	97850632	6374824	0
67	Nuh	Bhirawati	4.47426	2.1924	1.0291	1.0738	0.1342	0.0447	0	594	0	134	0	0	1276624	0	351676	0
68		Udaka	4.63863	2.2729	1.0669	1.1133	0.1392	0.0464	0	616	0	139	0	0	1323524	0	364596	0
69		Atta	2.29660	1.1253	0.5282	0.5512	0.0689	0.0230	0	305	0	69	0	0	655280	0	180512	0
70		Indri	20.79329	10.1887	4.7825	4.9904	0.6238	0.2079	0	2759	0	624	0	0	5932878	0	1634353	0
71		Khanpur	6.53313	3.2012	1.5026	1.5680	0.1960	0.0653	0	867	0	196	0	0	1864074	0	513504	0
72		Rewasan	10.36247	5.0776	2.3834	2.4870	0.3109	0.1036	0	1375	0	311	0	0	2956688	0	814490	0
73		Khedhi Kankar	0.23522	0.1153	0.0541	0.0565	0.0071	0.0024	0	31	0	7	0	0	67116	0	18489	0
74		Dhirdhoka	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0
75		Rupaheri	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0
76		Mehrola	0.19728	0.0967	0.0454	0.0473	0.0059	0.0020	0	26	0	6	0	0	56291	0	15507	0
77		Rojka Meo	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0
78		Sehsola	10.42317	5.1074	2.3973	2.5016	0.3127	0.1042	0	1383	0	313	0	0	2974007	0	819261	0
79		Mendla	8.07602	3.9573	1.8575	1.9382	0.2423	0.0808	0	1072	0	242	0	0	2304303	0	634775	0
80		Dhulawat	13.04099	6.3901	2.9994	3.1298	0.3912	0.1304	0	1731	0	391	0	0	3720940	0	1025022	0
81		Bidhuwas	1.84891	0.9060	0.4252	0.4437	0.0555	0.0185	0	245	0	55	0	0	527543	0	145324	0
82		Padheni	11.11867	5.4481	2.5573	2.6685	0.3336	0.1112	0	1476	0	334	0	0	3172451	0	873928	0
83		Gogjaka	7.88127	3.8618	1.8127	1.8915	0.2364	0.0788	0	1046	0	236	0	0	2248735	0	619468	0
84	Kaliyaka	1.67945	0.8229	0.3863	0.4031	0.0504	0.0168	0	223	0	50	0	0	479191	0	132005	0	

85	Goela	10.49398	5.1420	2.4136	2.5186	0.3148	0.1049	0	1393	0	315	0	0	2994210	0	824827	0
86	Dingarheri	7.39817	3.6251	1.7016	1.7756	0.2219	0.0740	0	982	0	222	0	0	2110895	0	581496	0
87	Sabras	10.95941	5.3701	2.5207	2.6303	0.3288	0.1096	0	1454	0	329	0	0	3127011	0	861410	0
88	Kalwari	19.14923	9.3831	4.4043	4.5958	0.5745	0.1915	0	2541	0	574	0	0	5463783	0	1505129	0
Total		151.60016	74.2841	34.8680	36.3840	4.5480	1.5160	0	20119	0	4548	0	0	43255542	0	11915772	0

Village – wise cost for Rabi crops

S. No.	District	Village	Private Land (in Hectare)	Land Breakup as per Rabi crop production in 2020-2021				Rabi Crop Production as per Kg/Hectare				Rabi Crop Cost as per MSP 2020-2021			
				Wheat (79%)	Rapeseed & Mustard (17%)	Gram (3%)	Barley (1%)	Wheat	Rapeseed & Mustard	Gram	Barley	Wheat	Rapeseed & Mustard	Gram	Barley
1	Palwal	Prithla	0.46792	0.3697	0.0795	0.0140	0.0047	1915	35	0	10	3781763	162012	0	16546
2		Chhaprola	10.87848	8.5940	1.8493	0.3264	0.1088	44517	810	0	240	87920879	3766553	0	384663
3		Kalwaka	1.67439	1.3228	0.2846	0.0502	0.0167	6852	125	0	37	13532579	579739	0	59206
4		Dehlaka	0.25546	0.2018	0.0434	0.0077	0.0026	1045	19	0	6	2064638	88450	0	9033
5		Paroli	2.46859	1.9502	0.4197	0.0741	0.0247	10102	184	0	55	19951355	854721	0	87289
Total			15.74483	12.4384	2.6766	0.4723	0.1574	64431	1172	0	348	127251214	5451474	0	556737
6		Ratikanoabad	2.93398	2.3178	0.4988	0.0880	0.0293	12006	66	0	16	23712676	308468	0	25584

S. No.	District	Village	Private Land (in Hectare)	Land Breakup as per Rabi crop production in 2020-2021				Rabi Crop Production as per Kg/Hectare				Rabi Crop Cost as per MSP 2020-2021				
				Wheat (79%)	Rapeseed & Mustard (17%)	Gram (3%)	Barley (1%)	Wheat	Rapeseed & Mustard	Gram	Barley	Wheat	Rapeseed & Mustard	Gram	Barley	
1	Palwal	Prithla	0.46792	0.3697	0.0795	0.0140	0.0047	1915	35	0	10	3781763	162012	0	16546	
2		Chhaprola	10.87848	8.5940	1.8493	0.3264	0.1088	44517	810	0	240	87920879	3766553	0	384663	
3		Kalwaka	1.67439	1.3228	0.2846	0.0502	0.0167	6852	125	0	37	13532579	579739	0	59206	
4		Dehlaka	0.25546	0.2018	0.0434	0.0077	0.0026	1045	19	0	6	2064638	88450	0	9033	
5		Paroli	2.46859	1.9502	0.4197	0.0741	0.0247	10102	184	0	55	19951355	854721	0	87289	
7		Khuntpuri	4.25932	3.3649	0.7241	0.1278	0.0426	17430	96	0	23	34424233	447810	0	37141	
8		Silani	6.38393	5.0433	1.0853	0.1915	0.0638	26124	144	0	35	51595512	671184	0	55668	
9		Karanki	5.07883	4.0123	0.8634	0.1524	0.0508	20784	115	0	28	41047575	533970	0	44287	
10		Sancholi	4.72218	3.7305	0.8028	0.1417	0.0472	19324	107	0	26	38165143	496474	0	41177	
12		Langra	3.73824	2.9532	0.6355	0.1121	0.0374	15298	85	0	20	30212845	393026	0	32597	
13		Bhaghanki	1.18118	0.9331	0.2008	0.0354	0.0118	4834	27	0	6	9546396	124185	0	10300	
14		Gurugram	Chandla Dugarwas	9.02959	7.1334	1.5350	0.2709	0.0903	36951	204	0	49	72977981	949339	0	78738
15			Fazalwas	0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0
16	Kukrola		0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	
17	Fakharpur		0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	
18	Mokalwas		1.68198	1.3288	0.2859	0.0505	0.0168	6883	38	0	9	13593905	176837	0	14667	
19	Kasan		5.03604	3.9785	0.8561	0.1511	0.0504	20608	114	0	27	40701724	529471	0	43914	
20	Baslambi		0.00759	0.0060	0.0013	0.0002	0.0001	31	0	0	0	61326	798	0	66	
21	Dhana		0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	
22	Basharia		0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	
23	Babra Bakipur		0.63991	0.5055	0.1088	0.0192	0.0064	2619	14	0	3	5171816	67278	0	5580	
24	Jhund Sarai Abad		1.12304	0.8872	0.1909	0.0337	0.0112	4596	25	0	6	9076487	118072	0	9793	
25	Patli Hajipur		21.58495	17.0521	3.6694	0.6475	0.2158	88330	488	0	118	174451582	2269366	0	188221	
26	Khentawas		4.16068	3.2869	0.7073	0.1248	0.0416	17026	94	0	23	33627028	437440	0	36281	
27	Saidpur Mohammadpur		8.72859	6.8956	1.4839	0.2619	0.0873	35719	197	0	48	70545302	917694	0	76113	

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				Wheat (79%)	Rapeseed & Mustard (17%)	Gram (3%)	Barley (1%)	Wheat	Rapeseed & Mustard	Gram	Barley	Wheat	Rapeseed & Mustard	Gram	Barley
30		Sultanpur	21.16549	16.7207	3.5981	0.6350	0.2117	86613	479	0	115	171061473	2225265	0	184563
Total			112.21018	88.6460	19.0757	3.3663	1.1221	459187	2537	0	612	906893352	11797386	0	978473
31	Jhajjar	Badsa	0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0
32		Mundakhera	7.95715	6.2861	1.3527	0.2387	0.0796	32562	864	308	32	64310413	4019389	1570502	51817
33		Ismilpur	1.94502	1.5366	0.3307	0.0584	0.0195	7959	211	75	8	15719869	982489	383889	12666
34		Dewarkhana	0.50333	0.3976	0.0856	0.0151	0.0050	2060	55	19	2	4067950	254246	99342	3278
35		Lagarpur	6.62168	5.2311	1.1257	0.1987	0.0662	27097	719	256	27	53517057	3344807	1306921	43120
36		Daryapur	5.53409	4.3719	0.9408	0.1660	0.0553	22647	601	214	23	44727013	2795430	1092263	36038
37		Badli	24.79210	19.5858	4.2147	0.7438	0.2479	101454	2693	959	101	200372112	1252322	4893217	161446
38		Majri	2.30924	1.8243	0.3926	0.0693	0.0231	9450	251	89	9	18663511	1166466	455775	15038
39		Gubhana	2.42559	1.9162	0.4124	0.0728	0.0243	9926	263	94	10	19603842	1225237	478739	15795
40		Bupania	14.53836	11.4853	2.4715	0.4362	0.1454	59494	1579	563	59	117500398	7343754	2869436	94674
41		Dabodha khurd	3.88246	3.0671	0.6600	0.1165	0.0388	15888	422	150	16	31378412	1961145	766281	25283
42		Mehandipur	5.62514	4.4439	0.9563	0.1688	0.0563	23019	611	218	23	45462924	2841425	1110234	36631
43		Jasour kheri	4.87141	3.8484	0.8281	0.1461	0.0487	19935	529	189	20	39371219	2460694	961471	31723
44		Kheri jasour	6.43957	5.0873	1.0947	0.1932	0.0644	26352	700	249	26	52045235	3252818	1270978	41934
45		Nilothi	4.59825	3.6326	0.7817	0.1379	0.0460	18817	500	178	19	37163487	2322711	907556	29944

46	Jakhoda	7.46141	5.8945	1.2684	0.2238	0.0746	30534	811	289	30	60303788	3768976	147265 8	48589	
47	Mandothi	0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	
48	Asaudha todran	0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	
Total		99.50480	78.6088	16.9158	2.9851	0.9950	407194	10809	3851	405	804207230	5026280 9	196392 62	647975	
49	Sonipat	Kirauli	4.34110	3.4295	0.7380	0.1302	0.0434	17765	1052	0	0	35085221	4893523	0	0
50		Pai	6.79676	5.3694	1.1554	0.2039	0.0680	27814	1648	0	0	54932095	7661673	0	0
51		Prahladpur	1.87673	1.4826	0.3190	0.0563	0.0188	7680	455	0	0	15167936	2115553	0	0
52		Barona	0.78661	0.6214	0.1337	0.0236	0.0079	3219	191	0	0	6357450	886708	0	0
53		Gopalpur	0.53635	0.4237	0.0912	0.0161	0.0054	2195	130	0	0	4334832	604602	0	0
54		Pipli	7.17054	5.6647	1.2190	0.2151	0.0717	29343	1738	0	0	57952962	8083010	0	0
55		Thana kalan	6.32575	4.9973	1.0754	0.1898	0.0633	25886	1533	0	0	51125347	7130726	0	0
56		Turakpur	7.53026	5.9489	1.2801	0.2259	0.0753	30815	1825	0	0	60860264	8488506	0	0
57		Mandori	2.65070	2.0940	0.4506	0.0795	0.0265	10847	643	0	0	21423176	2988005	0	0
58		Mandora	17.37116	13.7232	2.9531	0.5211	0.1737	71086	4211	0	0	140395395	1958169 6	0	0

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				Wheat (79%)	Rapeseed & Mustard (17%)	Gram (3%)	Barley (1%)	Wheat	Rapeseed & Mustard	Gram	Barley	Wheat	Rapeseed & Mustard	Gram	Barley
				59		Nahra	3.91534	3.0931	0.6656	0.1175	0.0392	16022	949	0	0
60		Mahla Majra	9.37861	7.4091	1.5944	0.2814	0.0938	38379	2274	0	0	75798795	10572063	0	0
61		Chhatehra Bhadurpur	7.46141	5.8945	1.2684	0.2238	0.0746	30534	1809	0	0	60303788	8410892	0	0
62		Jagdishpur	1.11120	0.8778	0.1889	0.0333	0.0111	4547	269	0	0	8980828	1252604	0	0
63		Nasirpur Bangar	0.00253	0.0020	0.0004	0.0001	0.0000	10	1	0	0	20442	2851	0	0
64		Harsana Khurd	0.27063	0.2138	0.0460	0.0081	0.0027	1107	66	0	0	2187290	305073	0	0
65		Harsana Kalan	0.34904	0.2757	0.0593	0.0105	0.0035	1428	85	0	0	2820991	393459	0	0
66		Akbarpur Barota	3.22990	2.5516	0.5491	0.0969	0.0323	13217	783	0	0	26104386	3640918	0	0
Total			81.10463	64.0727	13.7878	2.4331	0.8110	331896	19661	0	0	655495355	91425442	0	0
67		Bhirawati	4.47426	3.5347	0.7606	0.1342	0.0447	18310	202	0	97	36161357	937278	0	154702
68		Udaka	4.63863	3.6645	0.7886	0.1392	0.0464	18982	209	0	100	37489848	971712	0	160385
69		Atta	2.29660	1.8143	0.3904	0.0689	0.0230	9398	103	0	50	18561302	481097	0	79407
70		Indri	20.79329	16.4267	3.5349	0.6238	0.2079	85090	937	0	449	168053370	4355831	0	718949
71		Khanpur	6.53313	5.1612	1.1106	0.1960	0.0653	26735	294	0	141	52801351	1368576	0	225889
72		Rewasan	10.36247	8.1864	1.7616	0.3109	0.1036	42405	467	0	224	83750482	2170757	0	358293
73		Khedi Kankar	0.23522	0.1858	0.0400	0.0071	0.0024	963	11	0	5	1901102	49275	0	8133

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				Wheat (79%)	Rapeseed & Mustard (17%)	Gram (3%)	Barley (1%)	Wheat	Rapeseed & Mustard	Gram	Barley	Wheat	Rapeseed & Mustard	Gram	Barley
59	Nuh	Nahra	3.91534	3.0931	0.6656	0.1175	0.0392	16022	949	0	0	31644157	4413580	0	0
60		Mahla Majra	9.37861	7.4091	1.5944	0.2814	0.0938	38379	2274	0	0	75798795	10572063	0	0
61		Chhatehra Bhadurpur	7.46141	5.8945	1.2684	0.2238	0.0746	30534	1809	0	0	60303788	8410892	0	0
62		Jagdishpur	1.11120	0.8778	0.1889	0.0333	0.0111	4547	269	0	0	8980828	1252604	0	0
63		Nasirpur Bangar	0.00253	0.0020	0.0004	0.0001	0.0000	10	1	0	0	20442	2851	0	0
64		Harsana Khurd	0.27063	0.2138	0.0460	0.0081	0.0027	1107	66	0	0	2187290	305073	0	0
65		Harsana Kalan	0.34904	0.2757	0.0593	0.0105	0.0035	1428	85	0	0	2820991	393459	0	0
66		Akbarpur Barota	3.22990	2.5516	0.5491	0.0969	0.0323	13217	783	0	0	26104386	3640918	0	0
74		Dhirdhoka	0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0
75		Rupaheri	0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0
76		Mehrola	0.19728	0.1559	0.0335	0.0059	0.0020	807	9	0	4	1594473	41328	0	6821
77		Rojka Meo	0.00000	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0
78		Sehsola	10.42317	8.2343	1.7719	0.3127	0.1042	42654	470	0	225	84241065	2183472	0	360392
79		Mendla	8.07602	6.3801	1.3729	0.2423	0.0808	33049	364	0	175	65271185	1691785	0	279237
80		Dhulawat	13.04099	10.3024	2.2170	0.3912	0.1304	53366	587	0	282	105398520	2731859	0	450905
81		Bidhuwas	1.84891	1.4606	0.3143	0.0555	0.0185	7566	83	0	40	14943074	387314	0	63928
82	Padheni	11.11867	8.7838	1.8902	0.3336	0.1112	45500	501	0	240	89862155	2329167	0	384439	
83	Gogjaka	7.88127	6.2262	1.3398	0.2364	0.0788	32252	355	0	170	63697154	1650988	0	272503	

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				Wheat (79%)	Rapeseed & Mustard (17%)	Gram (3%)	Barley (1%)	Wheat	Rapeseed & Mustard	Gram	Barley	Wheat	Rapeseed & Mustard	Gram	Barley
59		Nahra	3.91534	3.0931	0.6656	0.1175	0.0392	16022	949	0	0	31644157	4413580	0	0
60		Mahla Majra	9.37861	7.4091	1.5944	0.2814	0.0938	38379	2274	0	0	75798795	10572063	0	0
61		Chhatehra Bhadurpur	7.46141	5.8945	1.2684	0.2238	0.0746	30534	1809	0	0	60303788	8410892	0	0
62		Jagdishpur	1.11120	0.8778	0.1889	0.0333	0.0111	4547	269	0	0	8980828	1252604	0	0
63		Nasirpur Bangar	0.00253	0.0020	0.0004	0.0001	0.0000	10	1	0	0	20442	2851	0	0
64		Harsana Khurd	0.27063	0.2138	0.0460	0.0081	0.0027	1107	66	0	0	2187290	305073	0	0
65		Harsana Kalan	0.34904	0.2757	0.0593	0.0105	0.0035	1428	85	0	0	2820991	393459	0	0
66		Akbarpur Barota	3.22990	2.5516	0.5491	0.0969	0.0323	13217	783	0	0	26104386	3640918	0	0
84		Kaliyaka	1.67945	1.3268	0.2855	0.0504	0.0168	6873	76	0	36	13573463	351815	0	58069
85		Goela	10.49398	8.2902	1.7840	0.3148	0.1049	42943	473	0	227	84813315	2198304	0	362840
86		Dingarheri	7.39817	5.8446	1.2577	0.2219	0.0740	30275	333	0	160	59792739	1549788	0	255799
87		Sabras	10.95941	8.6579	1.8631	0.3288	0.1096	44848	494	0	237	88575022	2295805	0	378933
88		Kalwari	19.14923	15.1279	3.2554	0.5745	0.1915	78362	863	0	414	154765889	4011428	0	662104
Total			151.60016	119.764	25.7720	4.5480	1.5160	620378	6830	0	3276	1225246867	3175758	0	524172
				1									0		7

Annexure 5.7**Village – wise detail of tree to be cut due to proposed HORC alignment**

Name of District	Name of Tehsil	NAME OF VILLAGE	Number of tree to be cut	Forest Tree	Govt. Tree	PVT Tree	Barren Land
Palwal	Palwal	Prithla-42	18	2	0	16	0
		Chhaprola-4	47	5	0	42	0
		Dehlaka-8	2	0	0	2	0
		Paroli-7	8	0	0	8	0
Gurugram	Sohna	Ratikanoabad-210	3	0	0	3	0
		Khuntpuri-209	12	0	0	12	0
		Silani-207	8	0	0	8	0
		Karanki-206	34	11	0	23	0
Nuh	Nuh	Bhirawati	13	0	0	13	0
Gurugram	Sohna	Sancholi-205	11	0	9	2	0
	Nuh	Atta-179	2	0	2	0	0
		Indri-197	7	5	0	2	0
		Khanpur-177	9	0	0	9	0
		Kherli Kankar-169	16	0	0	16	0

Name of District	Name of Tehsil	NAME OF VILLAGE	Number of tree to be cut	Forest Tree	Govt. Tree	PVT Tree	Barren Land
Nuh		Rupaheri	5	3	0	2	0
		Rojka Meo-173	12	12	0	0	0
	Tauru	Sehsaula-83	3	0	0	3	0
		Maindla-82	37	31	0	6	0
		Dhulawat-81	76	0	0	76	0
		Bidhuwas-80	68	0	0	68	0
		Padheni-78	12	0	0	12	0
		Gogjaka-75	2	0	0	2	0
		Goela-19	254	37	0	217	0

Name of District	Name of Tehsil	NAME Of VILLAGE	Number of tree to be cut	Forest Tree	Govt. Tree	PVT Tree	Barren Land
		Deengarheri-21	32	8	0	24	0
		Sabras-27	139	0	0	139	0
		Kalwari-6	40	3	0	37	0
Gurugram	Manesar	Udepuri-144	8	0	0	8	0
		Chandla Dungarwas-148	46	5	15	26	0
		Fazalwas-149	94	0	0	94	0
		Kukrola-151	61	60	0	1	0
		Fakharpur-133	12	0	0	12	0
		Kasan	5	2	0	3	0
		Mokalwas-132	136	30	54	52	0
		Kasan	14	0	1	13	0
	F. Nagar	Jhund Sarai Abad-124	1803	0	1800	3	0
			151	0	0	151	0
		Patli Hajipur-34	149	8	0	103	38
		Khentawas-118	10	4	0	6	0
		Sultanpur-39	23	0	0	23	0
Jhanjrola-38		4	0	0	4	0	

Name of District	Name of Tehsil	NAME Of VILLAGE	Number of tree to be cut	Forest Tree	Govt. Tree	PVT Tree	Barren Land
		Mubarikpur-37	4	0	0	4	0
Jhajjar	Badli	Mundakhera-78	12	0	0	12	0
		Ismilpur-79	1	0	0	1	0
		Dewarkhana-75	1	0	0	1	0
		Lagarpur-74	4	0	0	4	0
		Badli-72	9	0	0	9	0
		Daryapur-73	24	0	0	24	0
		Badli	149	25	0	124	0
		Majri-71	4	1	0	3	0

Name of District	Name of Tehsil	NAME Of VILLAGE	Number of tree to be cut	Forest Tree	Govt. Tree	PVT Tree	Barren Land	
	Bahadurgarh	Bupania-59	27	2	0	25	0	
		Dabodha Khurd-49	18	14	0	4	0	
		Mehandipur-50	1	0	0	1	0	
		Mandothi-53	43	9	0	34	0	
		Jakhoda-41 (New)	40	0	0	40	0	
			25	0	0	25	0	
		Asaudha Todran-28		101	13	16	72	0
			Jasour Kheri-17	43	20	0	23	0
			Kheri Jasour-18	14	0	0	14	0
			Nilothi-19	23	0	0	23	0
			Kirauli	12	0	0	12	0
			Pai	8	0	0	8	0
			Prahladpur	110	0	0	110	0
Barona			86	0	86	0	0	
Gopalpur			81	0	81	0	0	
Pipli			739	11	194	534	0	

Name of District	Name of Tehsil	NAME Of VILLAGE	Number of tree to be cut	Forest Tree	Govt. Tree	PVT Tree	Barren Land
Sonipat	Kharkhoda	Thana Kalan	637	0	0	637	0
		Turakpur	13	0	0	13	0
		Turakpur	3	0	0	3	0
		Mandora	206	65	0	141	0
	Sonipat	Nahra	2	0	0	2	0
		Mahla Majra	15	0	0	15	0
		Chhatehra Bhadurpur	59	25	0	34	0
		Mahla Majra	6	0	0	6	0
	Rai	Akbarpur Barota	12	5	0	7	0
	Sonipat	Jagdishpur	262	0	262	0	0

Name of District	Name of Tehsil	NAME OF VILLAGE	Number of tree to be cut	Forest Tree	Govt. Tree	PVT Tree	Barren Land
		Nasirpur Bangar	178	0	178	0	0
		Harsana Khurd	97	0	97	0	0
		Harsana Kalan	44	0	44	0	0
			6499	416	2839	3206	38



Annexure 6.1

**HARYANA ORBITAL RAIL CORRIDOR FROM PALWAL TO SONIPAT
BY LINKING ASAOTI-PATLI-ASAUDAH -HARSANA KALAN STATIONS**

DETAILS OF PARTICIPATORY STAKEHOLDERS

Stake Holders Out reach Event Guest List			Annexure – II
GOVERNMENT OF HARYANA			
S No.	Name	Organisation	Designation
1	Sh. Manohar Lal	State Government	Chief Minister, Haryana
2	Sh. Depinder Singh Dhesi, IAS	State Government	Chief Secretary, Haryana
3	Sh. Viney Partap Singh	State Government	DC Gurugram
4	Sh. Mani Ram Sharma, IAS	State Government	DC Palwal
5	Sh. Mohmad Sareen	State Government	Commissioner Of Police, Gurugram
6	Sh. V. Umashankar	State Government	Addl. PSCM
7	Sh. Alok Nigam, IAS	Public Works Department	Addl. Chief Secretary
8	Sh. Dilbagh S. Dahhiya	HSIIDC	
9	Smt. Divya Kamal	HSIIDC	
10	Sh. Manoj Prashar	HSWC	AM (QC)
11	Sh. Narhari Singh Banger	HSIIDC	MD
12	Smt. Suman	HSWC	JTA-
13	Sh. Biplav Kumar	DFCCIL	GGM/BD
14	Sh. Narhari Singh Banger	HSIIDC	
15	Sh. O.P. Goyal	HSIIDC	
16	Sh. .S.K Verma	HSIIDC	
MINISTRY OF RAILWAY			
S No.	Name	Organisation	Designation
17	Mr. Rajesh Agarwal	Railway Board	ED/MTP/RB
18	Mr. Devender Singh	Northern Railway	CTPM/NR
19	Sh. Baljeet Singh Kundu	Northern Railway	Estate Officer
20	Sh. Harpal Singh	Ministry of Railways	
21	Sh. Rajeev Kumar	NCRTC	
22	Sh. Vikas Kumar	NCRTC	
23	Sh. Dhanesh Gupta	NCRTC	
24	Sh. R.D Gupta	NCRTC	
25	Sh. S.K. Lohia	IRSDC	MD & CEO
INDUSTRIES/LOGISTIC BUSINESS ENTITIES			
S No.	Name	Organisation	Designation
26	Sh. Prakash Tulsiani	Allcargo	
27	Sh. Sudesh Paul Vatsa	Allcargo	
28	Sh. Nihar Mishra	Maruti Suzuki India	
29	Sh. Shigeo Yanai	Mitsui & co. India Pvt. Ltd	GM
30	Sh. Himanshu Bisht	Mitsui & co. India Pvt. Ltd	Manager
31	Sh. Rohit Ahuja	Dp. World	GM Business Development
32	Sh. S.V. Goyal	Private Sector Omaxe	
33	Sh. Pawan Chaudhary	Invest India	
34	Sh. Ajay Nijhawan	Reliance Model Economic Township	
35	Sh. N. Ramakrishna	Kribhco Infrastructure Limited	
36	Sh. Gaurav Kumar	Infratech Pvt Ltd	
37	Sh. Surender Kumar Goyal	Private Sector Omaxe	
38	Sh. Deepak Jain	Federation of Indian Industry	
39	Sh. CA Naveen Jain	Industrial Financial Branch	
40	Sh. Saurabh Bhayana	L & T Financial Service	
41	Sh. Naveen Kumar	JSC Corp	
42	Sh. Venugopal Batchu	Maruti Suzuki India	
43	Sh. Capt. Viren Bawa	CMA-CGM	CEO
44	Sh. Parikshit Nagpal	Bothra Group	Sr. General Manager
45	Dr. L.R Thapar	Hind Terminals	
46	Sh. Nitin Behl	Allcargo	SGM
47	Sh. Tarun Garg	Maruti	
48	Sh. Jaspal Singh	M3M	
49	Sh. Harish Aher	Deesha Associates	
50	Sh. Manoj Kumar	Microtek	
51	Sh. Dipender Kaushik	MFH	
52	Sh. Akhilesh Kaushik	MFH	
53	Sh. Harpal Singh	ED/WD/Railway Board	



**HARYANA ORBITAL RAIL CORRIDOR FROM PALWAL TO SONIPAT
BY LINKING ASAOTI-PATLI-ASAUDAH -HARSANA KALAN STATIONS
DETAILS OF PARTICIPATORY STAKEHOLDERS**

54	Sh. Shrivallabh Goyal	Reliance Met	Director-CEO
55	Sh. Alok Nigam	Public Works Department	IAS
56	Sh. Saurabh Suneja	NIIF	
57	Sh. K.S. Rao	Aarvee	
58	Sh. N. J Rao	Aarvee	
59	Sh. Dipesh Dipu	Aarvee	
60	Sh. Santosh Reddy	Aarvee	
PWC			
S No.	Name	Organisation	Designation
61	Sh. Mayank Kumar	PWC	
62	Smt. Tanisha Kalra	PWC	
63	Sh. Pawan Nyayapati	PWC	
64	Sh. Sanchit Aggarwal	PWC	
65	Sh. Raghav Issar	PWC	
66	Sh. Satender Pratap Singh	PWC	
67	Sh. Kunal Aggarwal	PWC	
68	Sh. Navneet Kumar	PWC	
69	Sh. Ritwik	PWC	
FUNDING AGENCIES : BANKS, FINANCIAL INSTITUTION			
S No.	Name	Organisation	Designation
70	Sh. A.K Azad	PNB	Executive Director
71	Smt. Rashmita	PNB	
72	Sh. N.D Bansal	PNB	
73	Sh. P.C. Sunoj	SBI	
74	Sh. S.K.Singh	Central Bank Of India	
HRIDC			
S No.	Name	Organisation	Designation
75	Sh. Rajender Bhati	HRIDC	Co-ordinator



हरियाणा रेल इन्फ्रास्ट्रक्चर डेवलपमेंट कॉर्पोरेशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक्रम)
Haryana Rail Infrastructure Development Corporation Ltd.
(A Joint Venture of Govt. of Haryana & Ministry of Railways)

DDPO
HCP

Dt.04.12.2020

No:HRIDC/ESIA/192

To,
Deputy Commissioner,
Mini Secretariat, DC Office, Jhajjar
Email: dcjir@hry.nic.in,
Tel: 01251-252300,
District Jhajjar, Haryana.

For Deputy Commissioner, Jhajjar

10-12-2020

Subject: Conveying competent authority regarding conducting public consultation.

Haryana Rail Infrastructure Development Corporation (A joint venture of Govt. of Haryana and Ministry of Railways) is executing Haryana Orbital Rail Corridor (HORC) project from Palwal to Sonipat (along KMP expressway). Land acquisition of the project is in progress.

A mandatory study on environmental and social impact assessment (ESIA) is required to be done by HRIDC as per funding agency (AIIB) policy guideline. In this connection HRIDC has appointed a consultant namely M/S Overseas Min-Tech Consultant, Jaipur (OMTC).

The consultant on behalf of HRIDC, will visit your office from time to time for help and support required from your end. The consultant also required to contact various NGOs working in the project area. A list of villages, Tehsils & Districts through which the corridor is passing is enclosed as Annexure-I. It is requested to provide the list of NGOs working in the area as per Annexure-I to the consultant.

Further, the consultant will conduct public consultation at Village level with all stake holders such as PWD, PHED, Irrigation, WRD, Miner irrigation and tube well, Village Panchayat and NGOs etc. Input from each stake holder is required to be collected for actual study of ESIA.

It is, therefore, requested that a meeting with all stake holders as above may be conveyed from your end at the earliest for conducting public consultation as per proposed schedule mentioned in Annexure-I.

DA: As above.

(Pradeep Kumar)

IRSE officer of 1996 Batch
General Manager/Projects
HRIDC/Gurugram

CC: M/S Overseas Min-Tech Consultant, Jaipur (OMTC) for information and N/A.

DS (P)	PC-(P)
Acctt. (H)	PC-I
Acctt. (P)	PC-II
PA-I	Diary
PA-II	Dt.....
EI.Asstt.	
D.A.	DDPO JHAJJAR

Gallow kr
860743984

① Bhadru g 98136 50453
Joginder

② SCPO - 87086 13 821
Rhotas

Badli g 97286 23123
SCPO
Mukesh

Lekhpal - 70159 73199
Sudesh



हरियाणा रेल इन्फ्रास्ट्रक्चर डेवलपमेंट कॉर्पोरेशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक्रम)
Haryana Rail Infrastructure Development Corporation Ltd.
(A Joint Venture of Govt. of Haryana & Ministry of Railways)

No:HRIDC/ESIA/ 193

Dt.04.12.2020

To
Deputy Commissioner
Mini Secretariat Sonipat,
Email: dcsnp@hry.nic.in,
Tel:0130-2220500
District Sonipat, Haryana

Subject: Conveying competent authority regarding conducting public consultation.

Haryana Rail Infrastructure Development Corporation (A joint venture of Govt. of Haryana and Ministry of Railways) is executing Haryana Orbital Rail Corridor (HORC) project from Palwal to Sonipat (along KMP expressway). Land acquisition of the project is in progress.

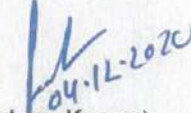
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DA: As above.


(Pradeep Kumar)
IRSE officer of 1996 Batch
General Manager/Projects
HRIDC/Gurugram

CC: M/S Overseas Min-Tech Consultant, Jaipur (OMTC) for information and N/A.

~~998~~
9671777483
Somu - DC office

SCO No. 17-19, 3rd & 4th Floor, Sector-17-A, Chandigarh-160017

Tele : 0172-2713644 E-mail : hridc2017@gmail.com Website:www.hridc.co.in

↓
Hari Parkash - Dy Suptd.

9255453306



हरियाणा रेल इन्फ्रास्ट्रक्चर डेवलपमेंट कॉर्पोरेशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक्रम)
Haryana Rail Infrastructure Development Corporation Ltd.
(A Joint Venture of Govt. of Haryana & Ministry of Railways)

No:HRIDC/ESIA/ 191

To,
Deputy Commissioner,
Mini Secretariat, Gurugram,
Email: dcgrg@hry.nic.in,
Tel: 0124-2321144,
District Gurugram, Haryana.

Dt.04.12.2020

Deputy Commissioner
Gurugram

Subject: Conveying competent authority regarding conducting public consultation.

Haryana Rail Infrastructure Development Corporation (A joint venture of Govt. of Haryana and Ministry of Railways) is executing Haryana Orbital Rail Corridor (HORC) project from Palwal to Sonapat (along KMP expressway). Land acquisition of the project is in progress.

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DA: As above.

(Pradeep Kumar)
IRSE officer of 1996 Batch
General Manager/Projects
HRIDC/Gurugram

CC: M/S Overseas Min-Tech Consultant, Jaipur (OMTC) for information and N/A.



हरियाणा रेल इन्फ्रास्ट्रक्चर डेवलपमेंट कॉर्पोरेशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक्रम)
Haryana Rail Infrastructure Development Corporation Ltd.
(A Joint Venture of Govt. of Haryana & Ministry of Railways)

No:HRIDC/ESIA/195

Dt.04.12.2020

To
Deputy Commissioner
Second Floor, Mini Secretariat Nuh
Nuh, Second Floor, Mini Secretariat
Email: dcnuh@hry.nic.in
Tel: 01267-274602
District Nuh, Haryana

Subject: Conveying competent authority regarding conducting public consultation.

Haryana Rail Infrastructure Development Corporation (A joint venture of Govt. of Haryana and Ministry of Railways) is executing Haryana Orbital Rail Corridor (HORC) project from Palwal to Sonipat (along KMP expressway). Land acquisition of the project is in progress.

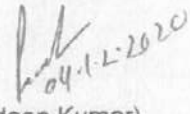
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It is, therefore, requested that a meeting with all stake holders as above may be conveyed from your end at the earliest for conducting public consultation as per proposed schedule mentioned in Annexure-I.

DA: As above.


(Pradeep Kumar)
IRSE officer of 1996 Batch
General Manager/Projects
HRIDC/Gurugram

CC: M/S Overseas Min-Tech Consultant, Jaipur (OMTC) for information and N/A.

Received on - 11-12-2020

PA to DC



DRO- 98 138 91626

Ramesh Lal .



89 300 31940

Arif Hussain (Lehpal .

Gulmigram - Subdivision
2005

Palwal
2008
Fardabad .



हरियाणा रेल इन्फ्रास्ट्रक्चर डेवलपमेंट कॉर्पोरेशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक्रम)
Haryana Rail Infrastructure Development Corporation Ltd.
(A Joint Venture of Govt. of Haryana & Ministry of Railways)

No:HRIDC/ESIA/ 194

Dt.04.12.2020

CA/An

To,
Deputy Commissioner,
Room No.1, 2nd Floor,
Mini secretariate, Palwal,
Dist-Palwal, Haryana,
Email-dcpwl@hry.nic.in
Tel-01275-298051

Subject: Conveying competent authority regarding conducting public consultation.

Haryana Rail Infrastructure Development Corporation (A joint venture of Govt. of Haryana and Ministry of Railways) is executing Haryana Orbital Rail Corridor (HORC) project from Palwal to Sonipat (along KMP expressway). Land acquisition of the project is in progress.

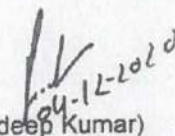
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It is, therefore, requested that a meeting with all stake holders as above may be conveyed from your end at the earliest for conducting public consultation as per proposed schedule mentioned in Annexure-II.

DA: As above.


(Pradeep Kumar)
IRSE officer of 1996 Batch
General Manager/Projects
HRIDC/Gurugram

CC: M/S Overseas Min-Tech Consultant, Jaipur (OMTC) for information and N/A.

SCO No. 17-19, 3rd & 4th Floor, Sector 17, Chandigarh-160017

Tele : 0172-2715644 E-mail: hridc@hry.nic.in Website: www.hridc.co.in

D.C OFFICE, PALWAL

RECEIVED
DATE: 04/12/2020

11.1.2020



हरियाणा रेल इन्फ्रास्ट्रक्चर डेवलपमेंट कॉर्पोरेशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक
Haryana Rail Infrastructure Development Corporation Ltd
(A Joint Venture of Govt. of Haryana & Ministry of Railways

No:HRIDC/ESIA/194

DI.04.12.2020

To,
Deputy Commissioner,
Room No.1, 2nd Floor,
Mini secretariate, Palwal,
Dist-Palwal, Haryana,
Email-dcpwl@hry.nic.in
Tel-01275-298051

D.C. OFFICE. PALWAL
DIARY No. 7562
DATE 11.12.2020

DR c/LAC

[Signature]
For DCPWL
11.12.2020

Subject: Conveying competent authority regarding conducting public consultation.

Haryana Rail Infrastructure Development Corporation (A joint venture of Govt. of Haryana and Ministry of Railways) is executing Haryana Orbital Rail Corridor (HORC) project from Palwal to Sonipat (along KMP expressway). Land acquisition of the project is in progress.

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It is, therefore, requested that a meeting with all stake holders as above may be conveyed from your end at the earliest for conducting public consultation as per proposed schedule mentioned in Annexure-I.

DA: As above.

[Signature]
(Pradeep Kumar)
IRSE officer of 1996 Batch
General Manager/Projects
HRIDC/Gurugram

CC: M/S Overseas Min-Tech Consultant, Jaipur (OMTC) for information and N/A

Handled by [Signature]
14.12.2020
(SDM)

SRNO..527 100/201.14/12/2020

CALA for this project is SDOC, Palwal &
to forward for further work.

Nazar Singh. PA to DC
98 136 12 100

L.
14/12/20

DRO - Ramphal Singh
↓

SDM office lekhpal

Suresh 999 114 8218

Varun Computer operator

999 6186 288.

Photograph of public Consultation



Village Kagan, Gurugram



Langra Udairi, Gurugram



Dhelaka Palwal



Chapraula, Plawal



Pirthala, Palwal



Khuntpuri and Ratikanobad, Palwal



Women consultation at Dhelaka, Palwal



Baghanki, Gurugram



Saidpur, Gurugram



Sancholi, Gurugram



National Highway 8, Delhi - Jaipur Expy, Kukrola,
Haryana 122051, India
Latitude 28°19'32.271"N Longitude 76°54'5.254"E
LOCAL 14:41:18 TUESDAY 03.30.2021
GMT 09:11:18 ALTITUDE 178 METERS

Kukrola, Gurugram



Western Peripheral Expy, Eakharpur, Haryana
122414, India
Latitude 28°19'29.780"N Longitude 76°53'26.346"E
LOCAL 17:55:12 TUESDAY 03.30.2021
GMT 12:25:12 ALTITUDE 0 METERS

Farkarpur, Gurugram



Mokalwas Near government school Mokalwas, Gurugram, Haryana 122413, India
Latitude 28°19'51.175"N Longitude 76°53'8.303"E
LOCAL 10:34:07 GMT 05:04:07 WEDNESDAY 03.31.2021 ALTITUDE 198 METER

Mokalwas, Gurugram



Unnamed Road, Patli Hajipur, Haryana 122506, India
Latitude 28°24'55.757"N Longitude 76°51'30.576"E
LOCAL 13:01:21 GMT 07:31:21 SATURDAY 04.03.2021 ALTITUDE 174 METER

Patli, Gurugram



Silani, Gurugram



Babra Bakipur



Jhanjraula, Gurugram



Kalwaka, Palwal



Sultanpur, Gurugram

Photographs of Jhajjar District Public Consultation



Asoda Village



Badli Village



Bupania Village



Daboda Village



Daryapur Village



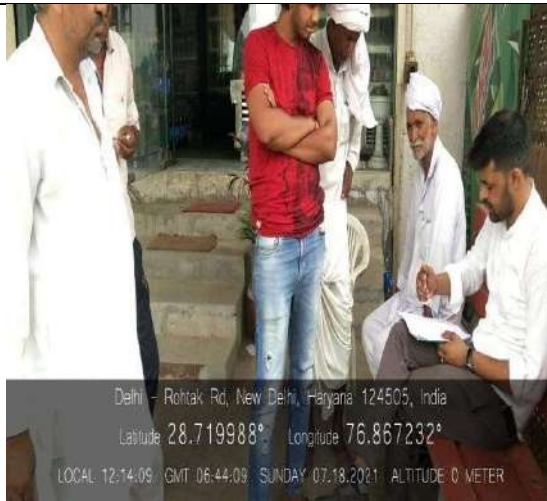
Dewarkha Village



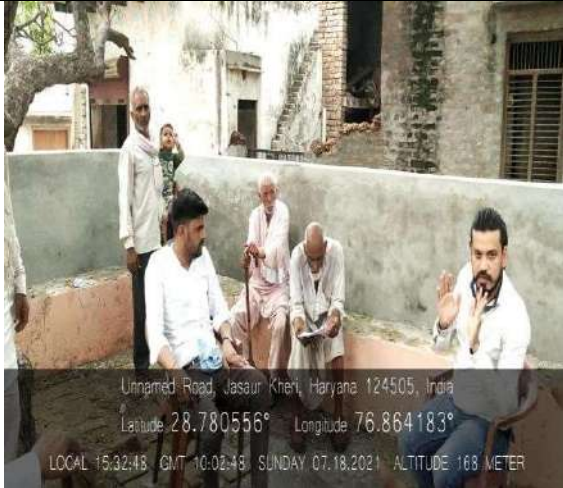
Gubhana Village



Ismailpur Village



Jakhoda Village



Jasaur Kheri Village



Kheri Jasaur Village



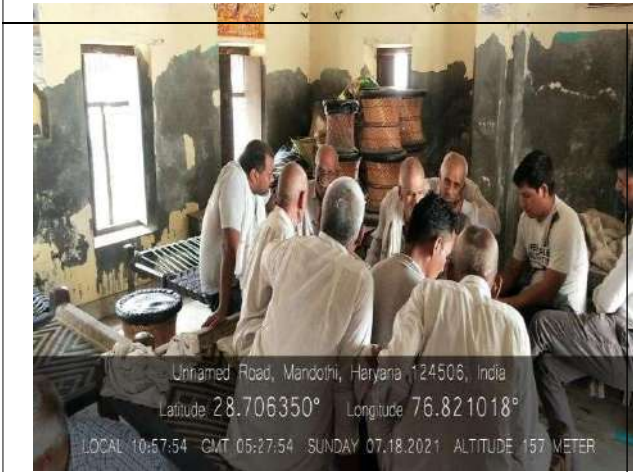
Lagarpur Village



Mahandipur Village



Majri Village



Mandothi Village



Unnamed Road, Haryana 124105, India
Latitude 28.527162° Longitude 76.850655°
LOCAL 12:00:05 GMT 08:30:05 THURSDAY 07.15.2021 ALTITUDE 0 METER



11Pro
2021.07.15 12:00

Mundakhera Village



Bahadurgarh - Kharkhoda Rd, Nilauthi, Haryana 124505, India
Latitude 28.807216° Longitude 76.871038°
LOCAL 13:08:22 GMT 07:38:22 SUNDAY 07.18.2021 ALTITUDE 157 METER



Bahadurgarh - Kharkhoda Rd, Nilauthi, Haryana 124505, India
Latitude 28.807227° Longitude 76.871036°
LOCAL 13:03:37 GMT 07:33:37 SUNDAY 07.18.2021 ALTITUDE 124 METER

Nilauthi Village

Photographs of Sonipat District Public Consultation



Barota and Bhadhurpur Village

Gopalpur Village



Jagdishpur Village

Malla Majra Village



Mandauri Village



Mandauri Village

Nahara Village



Unnamed Road, Haryana 131403, India
Latitude 28.938599° Longitude 77.006606°
LOCAL 18:30:54 GMT 13:00:54 WEDNESDAY 07.21.2021 ALTITUDE 163 METER



Nasirpur Rd Number 12, Haryana 131403, India
Latitude 28.934852° Longitude 77.020309°
LOCAL 18:13:15 GMT 12:43:15 WEDNESDAY 07.21.2021 ALTITUDE 169 METER



Western Peripheral Expy, Delhi, Haryana 131402, India
Latitude 28.818017° Longitude 76.900019°
LOCAL 13:01:24 GMT 07:31:24 MONDAY 07.19.2021 ALTITUDE 0 METER



Unnamed Road, Delhi, Haryana 131402, India
Latitude 28.805319° Longitude 76.930996°
LOCAL 12:58:10 GMT 07:28:10 MONDAY 07.19.2021 ALTITUDE 0 METER

Nasirpur Village



Unnamed Road, Delhi, Haryana 131402, India
Latitude 28.809853° Longitude 76.903060°
LOCAL 14:01:41 GMT 08:31:41 MONDAY 07.19.2021 ALTITUDE 169 METER



Unnamed Road, Pehladour- Kimoli, Haryana 131402, India
Latitude 28.809826° Longitude 76.903225°
LOCAL 14:45:33 GMT 09:15:33 MONDAY 07.19.2021 ALTITUDE 164 METER

Pai Village

Pehladpur and Kriholi Village



Sri Krishna, Delhi, Haryana 131402, India
Latitude: 28.861075° Longitude: 76.934237°
LOCAL 09:56:27 TUESDAY 07.20.2021
GMT 04:26:27 ALTITUDE 0 METER



Sri Krishna, Delhi, Haryana 131402, India
Latitude: 28.861075° Longitude: 76.934237°
LOCAL 09:56:24 TUESDAY 07.20.2021
GMT 04:26:24 ALTITUDE 0 METER



Pipli Village

Turkpur Rd Number 1, Tarakpur, Haryana 131402, India
Latitude 28.888514° Longitude 76.976726°
LOCAL 15:37:57 GMT 10:07:57 TUESDAY 07.20.2021
ALTITUDE 172 METER



Turkpur Rd Number 1, Tarakpur, Haryana 131402, India
Latitude 28.888542° Longitude 76.976662°
LOCAL 15:36:55 GMT 10:06:55 TUESDAY 07.20.2021
ALTITUDE 172 METER



Dayanand Namberdar Marg, Thana Kalan, Haryana 131402, India
Latitude: 28.886295° Longitude: 76.945774°
LOCAL 15:51:12 TUESDAY 07.20.2021
GMT 11:21:12 ALTITUDE 192 METER

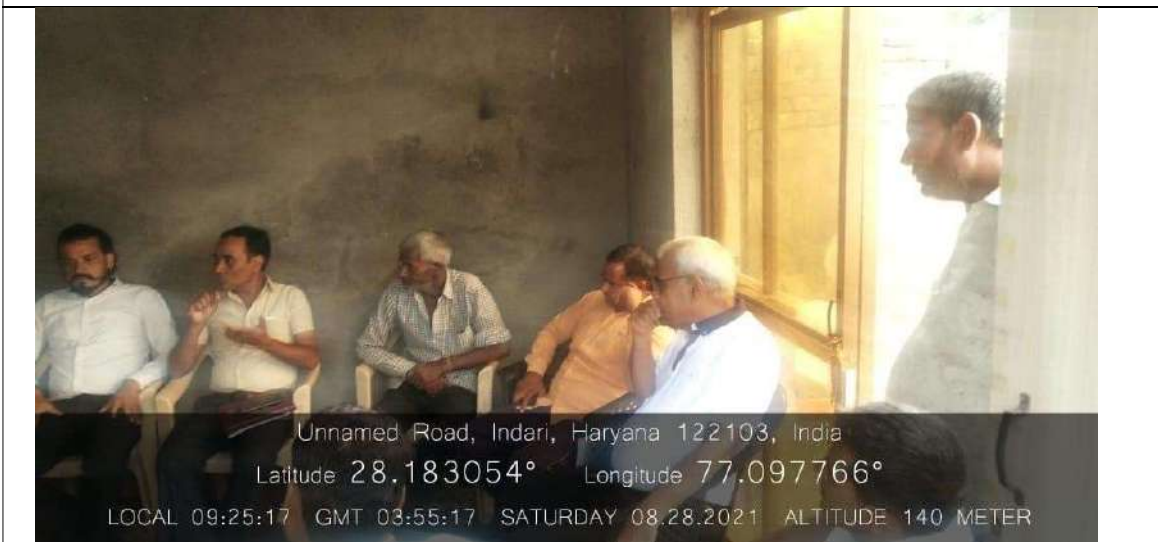


Unnamed Road, Thana Khurd, Haryana 131402, India
Latitude: 28.887313° Longitude: 76.951167°
LOCAL 15:36:44 TUESDAY 07.20.2021
GMT 11:06:44 ALTITUDE 0 METER

Thana Kalan Village



Goela Village



Indri Village



Unnamed Road, Khanpur, Haryana 122103, India

Latitude 28.196733° Longitude 77.087659°

LOCAL 10:29:32 GMT 04:59:32 SATURDAY 08.28.2021 ALTITUDE 145 METER

Khanpur Village



Unnamed Road, Maraula, Haryana 122103, India

Latitude 28.207461° Longitude 77.053869°

LOCAL 12:13:48 GMT 06:43:48 SATURDAY 08.28.2021 ALTITUDE 160 METER

Maraula Village



Unnamed Road, Maraula, Haryana 122103, India
Latitude 28.207462° Longitude 77.053858°
LOCAL 12:08:13 GMT 06:38:13 SATURDAY 08.28.2021 ALTITUDE 159 METER

Rojka Meo



Western Peripheral Expy, Sherpur - Kalaheri, Haryana 122103, India
Latitude 28.187014° Longitude 77.044688°
LOCAL 14:17:52 GMT 08:47:52 SATURDAY 08.28.2021 ALTITUDE 125 METER

Rupaheri Village

Annexure 6.4

Details of Issue/Suggestion raised by villagers during Public consultation

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Sultanpur- 10/03/2021			
1	No use of railway line unless stations are available.	Want railway station atvillage	Stations are proposed as per requirement.
2	Need satisfactory compensationfor every loss – (Structure loss, affected land, Tree, Tube-well, electric connection)	Satisfactory compensation is must.	Compensation for acquisition of land shall be provided asper RFCTLARR Act,2013.
3	Require road for transport andalso for irrigation facility.	Service road for irrigation facility and pipeline should be ensure.	Service road may be provided as per requirement.
4	Remaining land after acquisition should be compensated & overtakeby Govt.	Some person wants full compensation for remaining part of land.	HRIDC will acquire land as per requirement for HORC project.
5	Road should be provided as peradjacent to fencing boundary + service road	Service road should be governed & handover topanchayat, over bridgedrequire for footway and provisional road for transportation over railway line.	Road crossings may be provided with RUB/ROB as per the importance of the road.

6	In the affected land a 400 KV high tension line parallel to KMP is present which is affected.	Other than affected land, farmers also want to give the reaming partof land to the Govt. andneed compensation.	HRIDC will acquire land as per requirement for HORC project. If 400 KV high tension line is affecteddue to construction, it will be repaired
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Sultanpur- 10/03/2021			
			immediately.
7	Some villagers are not interested to handover the land to railway.	Avoid the residence area and railway search the alternate for this.	<p>The alignment has been conceived on Techno-Economic</p> <p>Consideration like future passenger traffic, freight traffic and interconnectivity to other existing and future railway corridors. However,</p> <p>HRIDC is trying to minimize land acquisition and resettlement issues. Wherever it is not possible adequate compensation shall be provided as per RFCTLARR Act, 2013.</p>

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Langra & Udaypuri- 13/03/2021			

1	<p>At present circle rate in:</p> <p>Udaypuri 67.15250 lacs/Kila (Circle Rate) and 3.5 crore market rate.</p> <p>Langra-48.45/Kila (Circle Rate) and market rate is 3.5 crore.</p>	<p>PAFs of Langra village wants increase in circle rate.</p>	<p>Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.</p>
2	<p>Compensation is not proper and</p>		<p>Compensation shall be provided after</p>

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Langra & Udaypuri- 13/03/2021			
	sufficient as per above rate.		valuation/assessment of the property by Competent Authority as per RFCTLARR Act,2013.
3	Govt. service in railway should be required if they left their land.		The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.
4	Should provide permission from govt. for shifting of tubwell.		HRIDC will provide assistance in getting permission for shifting of tubwell from the concerned department.
5	Borewell with electric connection should be provided by government.	For affected borewell.	Compensation will be provided after valuation of affected structure.
6	Remaining land should be also acquired by HRIDC/or give access road for remaining agriculture field.		HRIDC will acquire land as per requirement for HORC project. Wherever required, access road will be provided for use of general public.

7	Required service road on bothside of railway line.		Service road may be provided as per requirement. Land will be acquired after award.
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Langra & Udaypuri- 13/03/2021			
8	Compensation should be paidfully one time.		Compensation for acquisition of land shall be provided asper RFCTLARR Act,2013.
9	Circle rate is low in the area as compared to nearby villages	It should be same for all villages in a block.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act,2013.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Chandla Dungarwas- 13/03/2021			
1	Lack of educational facility in area (no collage/school in the village)	Required college in village.	Decision on provision of amenities such as educational facilities falls under the purview of district authorities.
2	Villagers require access road to agriculture field and main road/highway.		Access road may be provided as per requirement.

3	Compensation should be on equal rate.	Same compensation rate for all PAFs.	Compensation shall be provided after valuation/assessment of property by Competent Authority as per RFCTLARR Act, 2013.
4	There is no Govt. Hospital in the	Required hospital in	Decision on provision of amenities

	area.	village.	such as Hospitals falls under the purview of district authorities.
5	Remaining land also to be acquired by HRIDC or give the access road to remaining land/agriculture field.		HRIDC will acquire land as per requirement for HORC project. Wherever required ,access road will be provided for use of general public.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Fazalwas- 13/03/2021			
1	HRIDC does confirm about the alignment which portion of land is as per LAP will be acquired.	Please HRIDC justify about alignment.	The alignment has been conceived on Techno-Economic Consideration like future passenger traffic, freight traffic and interconnectivity to other existing and future railway corridors.

2	There is lack of education facility in the area.	Education facility required in the area.	Decision on provision of amenities such as educational facilities falls under the purview of district authorities.
3	There is lack of hostility facility in the area.	Hostility facility required in the area	Decision on provision of amenities such as

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			Hospitals falls under the purview of district authorities.
4	Underpass for NH-18 through KMP-(Pachgaon) will be required.		Road crossings may be provided with RUB/ROB as per the importance of the road.
5	There is no Gardner/Sweeper in Gram Panchayat		Not concerned with HRIDC.
6	If 80% land is acquired by HRIDC than framers what will be done for remaining land.	Remaining land also to be acquired by HRIDC.	HRIDC will acquire land as per requirement for HORC project.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Kasan- 13/03/2021			
1	Circle rate is very low (Kanal). The present circle rate is: 1. Circle Rate-88.5 Lac/Kanal for the village 2. (Other nearby area) Circle Rate-1.40 Crore/Kanal 3. Market Rate (Kasan)-1.6-3.6 Crore/Acr	Should compensate beneficiary amount.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.

	4. Market rate (Dhana)- 6crore/Acr		
2	Religious Structure (Temple) is very old, villagers want to safe it.	HRIDC search for another alternative foralignment.	The alignment has beenconceived on Techno- Economic Consideration like future passenger traffic, freight traffic and interconnectivity to other

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			<p>existing and futurerailway corridors. However,</p> <p>Compensation for shifting and developmentof Religious Structure (Temple), if affected, shall be provided in consultation with local people.</p>
3	Affected family require job in railway as per qualifications.	Require job in railway for one member/ PAF.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.
4	Require 7 nos. of underpass access road through KMP and 4 underpasses to nearby Panchayatvillage.	Access road require as par KMP (Fully Pakka Road required)	Road crossings may be provided with RUB/ROB as per the importance of the road.
6	Stations require at Kasan village, Fare should not be like Railway Rate for villagers	Stations Require in village. Fare Should be minimum for villagers.	Stations are proposed asper requirement.

7	Drainage system require for proper run off water as it spoiling nearby area/agriculture area.	People required proper drainage System.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			construction, it will be repaired immediately.
8	Previous (KMP) compensation is not fare and satisfactory.	Compensation rates should be more as compared to KMP pattern.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Karanki- 11/03/2021			
1	Market rate is very low for this area	Should require good market rate.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.
2	No proper access road for village.	Required metalled road.	Access road may be provided as per requirement.
3	Employment required for local people during construction phase.		Preference will be given to local people during construction of the project as per their skill.
4	Cash for acquired land.	Some PAFs want cash for acquired land.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.

5	Land in lieu of land.	Some PAFs want land in lieu of land.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013. No
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Karanki- 11/03/2021			
			provision for land for land.
6	Remaining Land in between proposed HORC and existing DFCCIL line also to be acquired by HRIDC.		HRIDC will acquire land as per requirement for HORC project. Wherever required ,access road will be provided for use of remaining road.
7	Govt. job for affected PAFs.		The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Khuntupuri & Ratinokobad- 11/03/2021			

1	Compensation for previous project ofDFCCIL was not met complete. Land value was not providing profitably.	Want compensation proof and onetimepayment as per market rate value.	Compensation for acquisition of land shall be provided asper RFCTLARR Act,2013. Compensation proofshall be provided to PAFs.
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2	<p>Ratinokobad village border rate should be as Hajipur village rate.</p> <p>1. Hajipur -1.88 Crore/Acre Remaining land also to be acquired by Government & Compensation to be paid fully.</p>	<p>Full Compensation Required (Section 4) (Section 6) (Section 9) In DFCCIL time</p>	<p>Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.</p> <p>HRIDC will acquire land as per requirement for HOREC project . Wherever required, access road will be provided for use of general public.</p>
3	<p>Market rate should be as per below rate:</p> <p>1. 1 Kila/80-90 Lacs(Rural) for barren land 2. 1Kila/2.5 crore (Rural) for agriculture area 3. 1Kila/ 7 crore (Rural) as in KMP village</p>		<p>Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013 after valuation/assessment of property by Competent Authority.</p>
4	<p>Access road is required for remaining land after acquisition.</p>	<p>Access road to every land part.</p>	<p>Access road shall be provided as per local requirement.</p>
5	<p>Stamp duty should be 5-7% for agriculture land and for nagarnigam-7-9%</p>	<p>To be study and revised.</p>	<p>Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.</p>

6	Full money to be compensate at onetime.	One-time full compensation requires.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.HRIDC may consider.
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7	Compensation money not received to themain land owner of the land/property & provided to the other land authority in DFCCIL project.	Money to be given to the true land owner as parland records.	Compensation money shall beprovided to actual owner as per the landrecords.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Kalwaka-			
1	Medical Service for affected family.	Required	Decision on provision of amenities such as Medical Service falls under the purview of district authorities.
2	Govt. hospitals required in thearea.	Required	Decision on provision of amenities such as Medical Facilitiesfalls under thepurview of district authorities.
3	Compensation should be given atone time.		Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013. HRIDC may consider.

	New water pipe line for remaining land.		Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to
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			alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.
4	Electricity line if affected is also required in the area.		If electricity line is damaged due to construction, it will be repaired immediately.
5	Palwal to Kalwa bus facility is required in the area	Required	Not concerned with HRIDC.
6	Education facility in the area.	Required	Decision on provision of amenities such as educational facilities falls under the purview of district authorities.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Paroli- 12/03/2021			
1	Hospital facilities required in the area.	Required	Decision on provision of amenities such as Hospital facilities falls

			under the purview of district authorities.
2	Education facilities required in the area.	Required	Decision on provision of amenities such as educational facilities falls under the purview of district

			authorities.
3	Compensation should be satisfactory.		Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
4	Road /Lights required in the area.		If Road/lights are affected due to construction of HARC project then it will be repaired immediately.
5	Pucca access road required to Dhana village.	Required	Access road may be provided as per requirement.
6	Medical facility for affected families.	Required	Decision on provision of amenities such as medical facilities falls under the purview of district authorities.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Chaprola- 11/03/2021			
1	Employment opportunity is required for PAFs.	It should be as per qualification/one member per PAF.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.

2	New access road is required in area after acquisition of land.	After land acquisition proper access road should be provided by Govt.	Access road may be provided as per requirement.
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			Land will be acquired afterward.
3	Due to the propose alignment, the water pipeline will be affected and divided in two part.	Should not intersect or find other solution.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.
4	The proposed railway track height is very high due to which runoff water/rainwater enters into the agriculture field and it damaged the crops.	Height of railway track should be decrease. HRIDC should find proper solution for rain water runoff for underpass and adjacent agriculture area.	Adequate waterway bridges/drainage facilities will be provided for drainage of stormwater as per design.
5	Land rate	Should be provided as per rate compensated in Prithala and nearby villages	Compensation for acquisition of land shall be provided as per RFTLARR Act, 2013.

6	Required Underpass For Access To Other Side Of Agriculture land	Provision for underpass and access road opposite /adjacent to land for easy access & mobility.	Road crossings may be provided with RUB/ROBs per the importance of the
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			road.
7	Land acquired and the remaining land after acquisition.	The remaining land should be also undertaken by railway & compensated properly.	HRIDC will acquire land as per requirement for HORC project. Wherever required, access road will be provided for use of general public.
8	Access road to Mandpuri village will be affected due to proposed alignment.	Transport road is needed to access to Mandpuri (pakka road required)	Road crossings may be provided with RUB/ROB as per the importance of the road.
9	Due to railway line proposed land is divided in to two parts & electricity & tube well is also affected	Compensation and provision for new tube well as well as electricity should be provided free by Government.	If tube well or electricity line is damaged due to proposed railway line, the same will be repaired immediately.
10	Underpass problem provided by Govt. till now does not follow up proper drainage for runoff water.	Proper drainage for runoff & light in the underpass & Maintenance.	Adequate waterway bridges/drainage facilities will be provided for drainage of stormwater as per design. Underpass area within Railway boundary will be maintained by HRIDC.

11	Circle Rate is going to incase from 1 st April 2021.	36.0 lacs/Acre is present rate and after 01.04.2021 it will be 1 Crore/Acre. So proper compensation will	Compensation for acquisition of land shall be provided as per
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		be required.	RFCTLARR Act,2013
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S.N o.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Dehlaka- 12/03/2021			
1	Circle Rate is low Previous Market Rate was 20Lac/Kanal –and Present MR is 75 to 1 Crore	Compensation Required As Pre Market Rate	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013
2	Employment required	One member /PAF required job in railway.	The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.
3	Station in Dhelaka	Station required forvillage.	Stations are proposedas per requirement.
4	Required compensation for tree onaffected land.	Required Compensation as pergirth size of tree.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013
5	No facility nearby like medical store Job for woman.	Required necessaryfacility & job.	Preference will be given to local people including women during construction of the project as per their skill.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Mokalwas- 31/03/2021			

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Mokalwas- 31/03/2021			
1	Market rate of this area is very low.	Require satisfactory rate compare to nearby villages.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
2	Remaining Land should be Overtake by HRIDC.	The remaining Land in between the proposed HORC alignment and existing DFCCIL line should acquire by HRIDC with compensation for the same.	HRIDC will acquire land as per requirement for HORC project. Wherever required ,access road will be provided for use of general public.
3	Access way (road) is required to agriculture or farm land for remaining land after acquisition.	Access road to every land part.	Road crossings may be provided with RUB as per the importance of the road.
4	Employment required for local people during construction phase.	Preference should be given to locals first.	Preference will be given to local people for employment during construction phase as per their skill.
5	Required railway crossing in Village.		RUB may be proposed as per requirement.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Bhaghanki- 1/04/2021			

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Bhaghanki- 1/04/2021			
1	Market rate issue in last year.	Last year Market rate compensated for DFCCIL project was low. Should compensate beneficiary amount.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
2	Remaining Land should overtake by HRIDC.	The remaining Land in between the proposed HORE alignment and existing DFCCIL line should acquire by HRIDC with compensation for the same.	HRIDC will acquire land as per requirement for HORE project. Wherever required, access road will be provided for use of general public.
3	On the way support for water is required for broken pipeline.		Pipelines crossing in the proposed railway line /in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any pipeline is damaged due to construction, it will be repaired immediately.

4	Provision of railway over bridge/ access road.	For accessibility to other side of agricultural land or farm land proper	RUB may be proposed as per requirement.
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Bhaghanki- 1/04/2021			
		access road & overbridge is required.	
5	Employment required for local people during construction phase.	Preference should be given to locals first.	Preference will be given to local people during construction of the project as per their skill.
6	Compensation as per farmer assets.	Actual & beneficiary Compensation is required as per farmer assets.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Kukrola- 30/03/2021			

1	Railway line to divert.	<p>Please divert the railway line to other route.</p> <p>The railway line to be diverted from the densely populated area.</p>	<p>The alignment has been conceived on Techno-Economic</p> <p>Consideration like future passenger traffic, freight traffic and interconnectivity to other existing and future railway corridors and Land use. Land for HORC has already been reserved in the Master Plan of Haryana. The</p>
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Kukrola- 30/03/2021			
			Alignment is mostly running away habitat area except few locations due to technical constraints.
2	Prohibition in Heavy structure area.	Denying land acquisition where crushing & demolition of structure is proposed (No to LAP in this area).	Alignment is mostly in open land except at few isolated locations due to technical design constants.
3	Compensation is required as per Market rate.		Compensation for loss of land and structures shall be provided as per RFCTLARR Act,2013.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Jhangrola- 08/04/2021			
1	No Access road & No Award (compensation) met		Access road may be provided as per requirement. Land will be acquired after award.
2	Effect on Panchayat Path Road.	The proposed alignment is intersecting the existing Panchayat road. Want continue access to Panchayat road in future also.	All shall crossings be with provide structure d s suitable crossing. for

3	Access to road from Kila 1 to 47 24 is closed as consequences of the proposed alignment.	Want HRIDC to look over this matter with good measures.	There are 2 Road Under Bridges (RUB) at this location which will
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Jhangrola- 08/04/2021			
	(Land Unit. 1 Kila = 1 acre)		enable the passage of public.
4	Assurance to Gram Panchayat for land for land compensation.	Required land for land.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013. No provision for land for land.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Shedpur Mohamadpur- 07/04/2021			
1	Effect on Water pipe line	Due to the proposed alignment water pipeline in these areas will be affected and will break. Required compensatory amount with layout of new water pipeline support from HRIDC.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.

2	Issues in Market Rate	Compensation should be met after review and registry of market rate in these areas.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Shedpur Mohamadpur- 07/04/2021			

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Silani- 05/04/2021			
1	Way to way accessibility	Require access road for all location and nearby villages. Proposed pakka access road wherever necessary.	All crossings shall be provided with suitable structures for crossing.
2	Market rate for this village is 2.50 crore/Acre.	Compensation required accordingly.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
3	Employment required for local people during construction phase.	Preference should be given to locals first.	Preference will be given to local people for employment during construction phase as per their skill.

4	Government Job	Required job in railway for 1 member/affected family.	The employment will be given as per government policy. Currently there is no provision of providing Govt.Job against land acquisition.
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Format for Public Consultation during Focus Group Discussion

Date :21/07/2021.

Chainage:

Location :ChateraBahadurpurHabitationPanchayat:

Tehsil :Sonipat...**District:** Sonipat

Supervisor Name: Rohit Pandey and RamJivan Yadav

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	A proper Government Policy should be there to provide fair and transparent compensations.	Required	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
2	Remaining land also to be acquired by Government & Compensation to be paid fully.	Full Compensation	HRIDC will acquire land as per requirement for HORC project.Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
3	When a house coming another alignment being demolished during the project then same compensation should be given for entire house of adjoining house attached with same wall.		Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
4	Access roads required for remaining land after acquisition.	Access road to every land part.	Access road shall be provided as per local requirement.

5	Stamp duty and other expenses while utilization of compensation money for other alternatives should be bore by Government.	To be study and revised.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
6	Full money to be compensated at onetime.	One time full compensation requires.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.HRIDCmay consider.
7	Compensation Part must be handled by Government in case of multiple owners. A very frequent fight always occurs between the beneficiaries.	Money to be given to the true land owner as per land records.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013 to the actual owner of the land.

<p>Date : 21-07-21</p> <p>Location: Jagdishpur</p> <p>Panchayat: Sonipat District...Sonipat</p>	<p>Chainage :</p>
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
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1	Required compensation for tree and structure on affected land.	Required Compensation as per girth size of tree.	<p>Compensation for acquisition of land and structure shall be provided as per RFCTLARR Act, 2013.</p> <p>Compensation for affected trees in private land shall be paid as per the evaluation made by a Valuer appointed by CALA.</p>
2	Land acquired and the remaining land after	Remaining land parcel is	HRIDC will acquire land as per requirements

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
	acquisition.	not useful for the farmer so they want Government to take whole land.	for HORC project.
3	Proper Road connectivity and infrastructure development in streamline with Urban area.	Infrastructure	Road crossings may be provided with RUB/ROB as per the importance of the road.
4	Land Plot in Lieu of Land		No provision for land for land.
5	To create employment opportunity in lieu of this development	Required necessary facility & job.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.
6	Other Land Area from Government Land should be given to daily workers, they will do farming and fair MSP should be given to such farmers exclusively.		Compensation for acquisition of land should be provided as per RFCTLARR Act, 2013.

Date :	22-07-21	Chainage :
Location:	Harsanakhurd	Habitation:
Panchayat:	Sonipat District...	Sonipat
Tahsil:		

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Other Structures like Well,Tubewell,Wire-Fencing,Garden,Cowshedetc.should be compensated fairly.	Structures Identification and Compensation	All private affected structures like Well, Tube well, Wire-Fencing, Garden, Cow shed etc shall be compensated based on valuation of the structure.
2	A major setback in agriculture yield for each farmers.	Loss of income should be converted into employment opportunities	The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.
3	Providing Service Road for people for public movement and a small business opportunity being provided by Government	Service road for irrigation facility and pipeline should be given.	<p>Service road may be provided as per requirement.</p> <p>Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will</p>

			berepaired immediately.
4	Station should be built in their	It will be beneficial	Stations are

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
	village only.	because it creates employment opportunities.	proposed as per requirement of theHORC project.
5	Other than affected land, farmers also want to give the reaming part ofland to the Govt. and need compensation.		HRIDC will acquire land as per requirement for HORC project. If required, access roadfacility shall be provided for the unacquired land.
6	Instead of residence area and productive land, railway should searchthe alternates for this.	New Alignment	<p>The alignment has been conceived on Techno-Economic</p> <p>Consideration like future passenger traffic, freight traffic and interconnectivityto other existing and future railway corridors. However,</p> <p>HRIDC is trying to minimize land acquisition and resettlement issues. Wherever it is not possible adequate compensation shall be provided as per RFCTLARR,Act,2013</p>

Date :	22-07-21	Chainage :
Location:	MarsanakalanHabitation:	
Panchayat:	Sonipat District...Sonipat	

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Project affected farmers should be provided Plot where they can earn livelihood		Compensation for acquisition of land shall be provided as per RFLARR Act,2013. No provision for land for land.
2	A major setback in agriculture yield for each farmers.	Loss of income should be converted into employment opportunities	The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.
3	Other Structures like Well,Tubewell,Wire-Fencing,Garden,Cowshedetc.should be compensated fairly.	Proper Cowsheds or compensation in lieu which will be useful to construct a new cowshed	All private affected structures like Well, Tube well, Wire-Fencing, Garden, Cow shed etc shall be compensated based on valuation of the structure.
4	Service road should be governed & handover to panchayat, over bridgedrequire for footway and provisional road for transportation over railway line.		Road crossings may be provided with RUB/ROB as per the importance of the road.

5	Other than affected land, farmers also want to give the remaining part of land to the Govt. and need compensation.		HRIDC will acquire land as per requirement for HORC
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			project. Compensation for acquisition of land shall be provided as per RFLARR Act, 2013.

Date : 21/07/2021..... **Chainage**.....

Location : Narsinghpur Bangar..... **Habitation** **Panchayat:**

Tehsil : Sonipat... **District:** Sonipat

Supervisor Name: Rohit and RamJivan Yadav

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Borewell with electric connection should be provided by government.	For affected borewell.	Compensation will be provided after valuation of affected structure.
2	Villagers require access road to agriculture field and main road/highway.		Access road may be provided as per requirement.

3	Free training for educated farmers and job opportunity in the project.		The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition. Training for restoration of livelihood of affected persons shall be provided.
4	Remaining Land Parcels, when a small land part is remaining then		HRIDC will acquire land as per

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
	Government should take it and provide fair compensation		requirement for HORC project. Wherever required, access road will be provided for use of general public.
5	HRIDC does confirm about the alignment which portion of land is as per LAP will be acquired.		The detail of land to be acquired shall be published in 20E gazette notification.
6	Compensation should be paid fully in one time.	Fair Compensation	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013 by CALA.

<p>Date : 21/07/2021.....</p> <p>Location : Nahra..... Habitation..... Panchayat :.....</p> <p>Tehsil : Sonipat... District: Sonipat</p> <p>Supervisor Name: Rohit and RamJivan Yadav</p>	<p>Chainage.....</p>
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Our Land is coming along both sides of KMP and Railway Line so we need road from both sides.		Access road may be provided as per requirement.
2	Gale India bought land at the rate of Rs.2.90 crs per acre so they want compensation on the same terms.		Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.

3	Free training for educated farmers and job opportunity in the project.		Training for restoration of livelihood of affected persons shall be provided.
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.
4	Royalty on our land should be properly given.		In addition to the compensation for lossof land, the affected family will have the option to opt for annuity or one time financial assistance.
5	A Clear LAP is being asked by people to identify their Survey Nos,		To be published in 20E gazette notification.
6	Structures, Trees and Cowshedsetc. should be paid fairly.	To provide new plot for Cowshed.	Compensation shall be provided after valuation/assessment of property by Competent Authorityas per RFCTLARR Act,2013.

Date : 21/07/2021.....	Chainage
Location :Akbarpur Barota.....	Habitation
Panchayat :.....	
Tehsil : Sonipat... District : Sonipat	
Supervisor Name : Rohit and RamJivan Yadav	

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	A PROPER Road should be given to access our lands.		Access road may be provided as per requirement.

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
2	Minimum Rate should be 6 -7 crore per Acre		Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
3	Remaining Land part should also be compensated and the ownership of remaining land should be with the owners.		Compensation shall be given as per RFCTLARR Act,2013 only for the acquired land and the same land will be under the possession of project proponent.
4	Royalty should be provided on the basis of KMP.		Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013. In addition to the compensation for loss of land, the affected family will have the option to opt for annuity or one time financial assistance.

5	Electricity Line must be shifted. Government must ensure supply of water, pipelines etc. sources		If electricity line is damaged due to construction, it will be repaired
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			<p>immediately.</p> <p>Pipelines crossing the proposed railwayline in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.</p>
6	Farmers are asking for Employment on the basis of eligibility and Training for different fields.	Income Restoration	<p>The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.</p> <p>Training for restoration of livelihood of affected persons shall be provided.</p>

Date : 21/07/2021.....

Chainage:

Location :MalhaMajra..... **Habitation**.....**Panchayat** :

Tehsil : Sonipat...**District:** Sonipat

Supervisor Name: Rohit and RamJivan Yadav

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	New Plot with Proper Electricity and Water supply for each farmer majorly for those who are losing very large part of their land.		Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013. No provision for land for land.
2	Our Pipelines, Bores etc. are coming under the alignment so proper compensation should be given.		Pipelines crossing the proposed railwayline in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.
3	Remaining Land part should also be compensated and the ownership of remaining land should be with the owners.		Compensation shall be given as per RFCTLARR Act,2013 only for the acquired land and the same land will be under the possession of project proponent.

4	Rate of Land at least 5 crs.		Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
5	In between KMP and Railways our land is coming which is not coming		Access road shall be provided as per

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
	under the alignment so a proper road for travelling should be provided.		local requirement.
6	Drainage system require for proper run off water as it spoiling nearby area/agriculture area.	People required proper drainage System.	Adequate waterway bridges/drainage facilities will be provided for drainage of storm water as per design.

Date : 14/07/2021	Chainage (Kms) :
Location : Devarkhana	Habitation :
Tehsil : Badli	District : Jhajjar
Supervisor Name: Rohit and Ram Jivan Yadav	

S.No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Loss of connection between the two villages due to the proposed alignment.	Request for an underpass between Smilpur and Devarkhana	Road crossings may be provided with RUB/ROB as per the importance of the road.
2	Station demand in Devarkhana Village	Request for proposal of station at Devarkhana village for which land is also available.	Stations are proposed as per traffic demand and other technical consideration.

3	Compensation for demolition of house	<p>Compensation request towards adjoining structures w.r.t affected structures which are also going to be affected as a result of demolition process.</p>	<p>Compensation for demolition of structure shall be provided as per RFCTLARR Act, 2013.</p>
4	Denied partially compensation.	<p>One time full compensatory amount is to be released.</p>	<p>Compensation for acquisition of land shall be provided by the competent authority as per RFCTLARR Act, 2013.</p>

5	Stamp duty and other expenses while utilization of compensation money for other alternatives should be borne by Government.	Other mandatory Expenses should be given by concerned authority	Compensation shall be provided by the competent authority as per RFCTLARR Act, 2013.
6	Provision of access road.	After land acquisition access road should be provided to the main road from the remaining land.	Access road may be provided as per requirement.

Date : 14-07-21	Chainage (Kms) :
Location : LAGARPUR	Habitation :
Tehsil : BADLI	District : JHAJJAR

Supervisor Name : ROHIT AND RAMJIVAN YADAV

S.No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	As now a days it's very difficult to buy a fertile land and near or within the village which is sources of livelihood for Agriculture, cowsheds, etc. for the villagers. So many PAFs are demanding land in lieu of fertile land.	Land in Lieu of Land	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013. No provision for land for land.

2	<p>As it is difficult to manage and utilize a small portion of remaining land on both side</p> <p>of the alignment so villagers want full acquisition of land with full compensation.</p>	<p>Remaining land after acquisition</p> <p>should also overtake by Government and compensation for the same should be made.</p>	<p>HRIDC will acquire land as per requirement for HARC project. Wherever required, access road will be provided for use of remaining land parcel.</p>
3	<p>Other land area from Government land should be given to daily workers, they will do farming and fair MSP should be given to</p>	<p>Source of income</p>	<p>Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013. No provision for</p>

	such farmers exclusively.		land for land.
4	Only source of irrigation pipeline is likely to be affected due to the proposed rail alignment.	Provision new or shifting of pipeline.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.
5	The name of Devarkhana Station should be changed as Lagarpur because 100% Area comes under Lagarpur.	Rename of station	This issue will be taken up separately as per the rules of State Government.
6	As the rate in nearby villages is high so compensation rate should be equal in both villages.	Demand for fair and equal compensation.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.

Date : 15-07-21	Chainage(Kms) :
Location : ISMILPUR	Habitation :
Tehsil : BADLI	District : JHAJJAR
Supervisor Name: ROHIT AND RAMJIVAN YADAV	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as

			per RFCTLARR Act, 2013.
2	As it is difficult to manage and utilize a small portion of remaining land on both side of the alignment so villagers want full acquisition of land with full compensation.	Remaining land after acquisition should also overtake by Government and compensation forthe same should be made.	Land will be required as per requirement for HORC project.
3	Access road in and near the project alignment if affected, anew provision road should be proposed/ temporary accessroad should be made during construction period only.	Access to transportation communication or road should not be interrupted.	Road crossings may be provided with RUB/ROB as per the importance of the road.

Date : 15-07-21	Chainage (Kms) :
Location : BADLI	Habitation :
Tehsil : BADLI	District : JHAJJAR
Supervisor Name: ROHIT AND RAMJIVAN YADAV	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	PAFs should be provided land where they can earn livelihood.	Land in lieu of beneficial land.	Compensation to projectaffected families shall be provided as per RFCTLARR Act, 2013. No provision for providing the plot/land. However, training shall be provided for income restoration.

2	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
3	Proposal/ renewal of new/	New Pipelines with good condition need to be	Pipelines crossing the proposed railway line in the

	defected pipeline for irrigation.	proposed if are going to be affected or renewed if get defected due to the project.	project area shall be protected suitably and pipelines running parallel and very close to alignment shall be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.
4	Additional compensation should be given for Fisheries, Wells, House, other structures.	Compensation for every affected property.	Compensation for land acquisition and other affected properties shall be provided as per RFCTLARR Act, 2013.
5	The remaining small portions of land on both side of the alignment are useless to the farmers so want it to be also acquired.	Remaining land after acquisition should also acquire by Government and compensation for the same should be made.	Land will be acquired by HRIDC as per requirement for HORC project.
6	Loss of access road as a result of construction of proposed rail alignment.	Provision of proper access road to remaining farm land should be provided.	Road may be provided as per requirement. Land will be acquired after award.
7		Stamp Duty should be given free.	Compensation shall be provided by the competent authority as per RFCTLARR Act, 2013.
8	Employment opportunities to 1 person per project affected families.	Locals must be provided jobs and employment opportunities.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.

Date : 15-07-21	Chainage (Kms) :
Location : MUNDAKHERA	Habitation :
Tehsil : BADLI	District : JHAJJAR
Supervisor Name: ROHIT AND RAMJIVAN YADAV	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	No interruption on access to roads and crossings during construction as well as on operation phase.	Necessary Road Crossing must be proposed with new access roads wherever required.	Road crossings may be provided with RUB/ROB as per the importance of the road.
2	Additional compensation should be given for Fisheries, Wells, House, other structures.	Compensation for every affected property.	Compensation for land acquisition shall be provided as per RFCTLARR Act, 2013.
3	Fair compensation must be given to every PAFs for every loss of agricultural land.	Fair and equal compensatory compensation should be met.	Compensation shall be provided as per RFCTLARR Act, 2013.
4	Fair compensation adjoining to nearby villages.	Rate must be as per District Level Committee rate (DLC).	Compensation for land acquisition shall be provided as per RFCTLARR Act, 2013.
5	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013

Date	: 15-07-21	Chainage	:
Location	: DARIYAPUR	Habitation	:
Panchayat	:		

Tehsil : BADLI District : JHAJJAR
Supervisor Name: Rohit and Ram Jivan Yadav

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Acquisition of remaining middle land with fair compensation.	Remaining land between Railway Line and NCR Canal should be also acquired by Government.	HRIDC will acquire land as per requirement for HORC project.
2	Rate for Badli Sub-Division and for entire railway line should be same.	Rate must be as per District Level Committee rate (DLC).	Compensation for land acquisition shall be provided as per RFCTLARR Act, 2013.
3	Maximum satisfactory compensation to all.	As per demand by PAFs all land losers must be compensated maximum.	Compensation for land acquisition shall be provided as per RFCTLARR Act, 2013.
4	After Land Acquisition Local people should be provided Job in this Project	Provision of job in railway to 1 person per PAFs in the affected district after land acquisition.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.

5	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	Compensation shall be provided after valuation/assessment of the property by Competent Authority
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			as per RFCTLARR Act, 2013

Date : 16-07-21	Chainage :
Location : Gubhana Panchayat :	Habitation :
Tehsil : BADLI	District : JHAJJAR
Supervisor Name: Rohit and RamJivan Yadav	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 5 crore per acres dueto increase in Input cost.	Compensation shall beprovided after valuation/assessment of theproperty by Competent Authority as per RFCTLARR Act, 2013
2	The remaining small portions of land on both side of the alignment are useless to the farmers so want it to be also acquired.	Remaining land after acquisition should also acquire by Government andcompensation for the same should be made.	HRIDC will acquire land as per requirement for HORC project.
3	Job opportunities to PAFs	Provision of job in railway to 1 person per PAFs in the affected district afterland acquisition.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.

4	Also Royalty should be given every year alike KMP.		<p>In addition to the compensation for loss of land, the affected family will have the option to opt</p> <p>for annuity or one-time financial assistance.</p>
	Compensation towards other property/ structural loss.	Well, Tubewells, Canals should be	<p>Compensation shall be paid for affected structures</p> <p>after valuation by</p>

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
5		compensated fairly.	Competent Authority.
6	Irrigation canals should be constructed permanent.	The sections where any likely damage to irrigation canals might occur should be protected or new line must be proposed.	Decision on construction of irrigation canal does not falls under the purview of HRIDC.

Date : 16-07-21	Chainage :
Location : BUPANIA	Habitation :
Panchayat :	
Tehsil : BADLI	District : JHAJJAR
Supervisor Name : ROHIT AND RAMJIVAN YADAV	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Job opportunities to PAFs	Provision of job in railway to 1 person per PAFs in the affected district after land acquisition.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.

2	Compensation towards otherproperty/ structural loss.	Well, Tubewells, Canals should be compensated fairly.	Compensation shall be paid for affected structures after valuation by Competent Authority.
	Maximum rates should be given as	Rate must be as perDistrict Level	Compensation for land acquisition shall be provided as per

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
3	per village.	Committee rate (DLC).	RFCTLARR Act, 2013.
4	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 5 crore per acres due to increase in Input cost.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
5	Earliest One time compensation.	Compensation should be released to the PAFs on immediate basis.	Compensation shall be provided by the Competent Authority as per RFCTLARR Act, 2013
6	Provision of railway station at the village.	Request for railway station by villagers for easy transportation communication.	Stations are proposed as per traffic demand and other technical consideration.

Date : 16-07-21	Chainage :
Location : MAJRI	Habitation :
Panchayat :	
Tehsil : BADLI	District : JHAJJAR
Supervisor Name: ROHIT AND RAMJIVAN YADAV	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Existing canal underneath the KMP highway for the purpose to drain out storm water runoff to avoid situation of flood in the nearby village areas should be protected and should not be affected as result of any construction activities.	Similarly the design of track should be such that the canal passes underneath the track.	Decision on construction of irrigation canal does not falls under the purview of HRIDC. Adequate waterway bridges/drainage facilities will be provided for drainage of storm water as per design.
2	In some section remaining land is left on both side of the proposed alignment where land is proposed to be acquired through middle.	Land after acquisition on both side of the track should provide a road for the farmers to easily accessible.	Road crossings may be provided with RUB/ROB as per the importance of the road.
3	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013

4	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 5 crore per acres due to increase in Input cost.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
5	Earliest One time compensation.	Compensation should be released to the PAFs on immediate basis.	Compensation shall be provided by the Competent Authority as per RFCTLARR Act, 2013

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
6	Provision of railway station at the village.	Request for railway station by villagers for easy transportation communication	Stations are proposed as per traffic demand and other technical consideration.

Date	: 17-07-21	Chainage	:
Location	: ASAUDA TODRA	Habitation	:
Panchayat	:		
Tehsil	: BAHADURGARH	District	: JHAJJAR
Supervisor Name: ROHIT AND RAMJIVAN YADAV			

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Job opportunities to local project affected families (PAFs)	Provision of job in railway to 1 person per PAFs in the affected district after land acquisition.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.
2	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 4 crore per acres due to increase in Input cost.	Compensation for loss of land shall be provided after valuation/assessment of the property by Competent Authority as per RFLARR Act, 2013.

3	<p>Compensation towards other property/ structural loss.</p>	<p>Well, Tubewells, Canals should be compensated fairly.</p>	<p>Compensation for affected properties shall be provided after valuation/ assessment by Competent Authority.</p>
4	<p>As now a days it's very difficult to buy a fertile land and near or within the village which is sources of livelihood for</p>	<p>Land in Lieu of Land</p>	<p>Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013. No provision for land for land.</p>

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
	Agriculture, cowsheds, etc. for the villagers. So many PAFs are demanding land in lieu of fertile land.		
5	Request for connecting station for easily accessible to transportation.	Asauda Station should be connected through both sides.	The alignment has been conceived on Techno-Economic Consideration like future passenger traffic, freight traffic and interconnectivity to other existing and future railway corridors. However, HRIDC is trying to minimize land acquisition and resettlement issues.
6	Compensation for remaining small portion of land after acquisition.	Remaining part of land should also be compensated and the ownership of remaining land should be with the owners.	HRIDC shall acquire land as per requirement of the HORC project and the acquired land shall be under the possession of HRIDC.
7	Existing canal underneath the KMP highway for the purpose to drain out storm water runoff to avoid situation of flood in the nearby village areas should be protected and should not be affected as result of any construction activities.	Similarly the design of track should be such that the canal passes underneath the track.	Decision on construction of irrigation canal does not fall under the purview of HRIDC. Adequate waterway bridges/drainage facilities will be provided for drainage of storm water as per design.

8	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
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Date : 17-07-21	Chainage :
Location : MEHNDIPUR	Habitation :
Panchayat :	

Tehsil : BAHADURGARH	District : JHAJJAR
Supervisor Name: ROHIT AND RAMJIVAN YADAV	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 5 crore per acres due to increase in Input cost.	Compensation for loss of land shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
2	Assistance for Landless laborer's	Landless Labour who are dependent upon the Land should be separately compensated.	R&R assistance for landless laborer's who are dependent on land to be acquired shall be provided as per RFCTLARR Act, 2013.
3	Compensation towards other property/ structural loss.	Well, Tubewells, Canals should be compensated fairly as it will affect.	Compensation for affected properties shall be provided after valuation/assessment by Competent Authority.
4	Earliest One time compensation.	Compensation process should be easy and immediate payment is required.	Compensation shall be provided by the Competent Authority as per RFCTLARR Act, 2013

5	As the village is coming under KMP so people face problems in travelling hence a station must be provided.	Demand of Station by villagers	Stations are proposed as per traffic demand and other technical consideration.
6	Compensation for remaining small portion of land after acquisition.	Remaining part of land should also be compensated	HRIDC shall acquire land as per requirement of the HORC project and the acquired land

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
		and the ownership of remaining land should be with the owners.	shall be under the possession of HRIDC.
7	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
8	Job opportunity in Railway Projects for Project Affected Families (PAFs).	Provision of job in railway to 1 person per PAFs in the affected district after land acquisition.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.
Date : 17-07-21 Chainage : Location : BODHA KHURD Habitation : Panchayat :			
Tehsil : BAHADURGARH District : JHAJJAR Supervisor Name: ROHIT AND RAMJIVAN YADAV			
S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 5 crore per acres due to increase in Input cost.	Compensation shall be provided after valuation/assessment of the property by

			Competent Authority as per RFCTLARR Act, 2013
2	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	
3	Demand for railway station at village.	Railway Station should be provided in the village, so villager's movement	Stations are proposed as per traffic demand and other technical consideration.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
		becomes easy.	
4	Employment Opportunity to landloosers.	Provision of job in railway to 1 person per PAFs in the affected district afterland acquisition.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.
5	Royalty should be given according to KMP		In addition to the compensation for loss of land, the affected family will have the option to opt for annuity or one-time financial assistance.
6	Compensation for remaining small portion of land after acquisition.	Remaining part of land should also be compensated and the ownership of remaining land shouldbe with the owners.	HRIDC shall acquire land as per requirement of the HORC project and the acquired land shall beunder the possession of HRIDC.
7	Demand for fair and equalcompensation.	Same compensationto be made from Kundli to Palwal.	Compensation shall beprovided after valuation/assessment ofthe property by Competent Authority asper RFCTLARR Act, 2013

8	Maximum compensation rate for thePAFs of the district.	District level community rate (DLC) should be maximum.	Compensation for landacquisition shall be provided as per RFCTLARR Act, 2013.
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Date : 18-07-21		Chainage :	
Location : JASOR KHERI		Habitation :	
Panchayat :			
Tehsil : BAHADURGARH		District : JHAJJAR	
Supervisor Name: ROHIT AND RAMJIVAN YADAV			
S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 5 crore per acres due to increase in Input cost.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
2	Employment Opportunity to land losers.	Provision of job in railway to 1 person per PAFs in the affected district after land acquisition.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.
3	As the proposed alignment will cross through irrigation pipelines which are a source of water supply for agricultural purpose, it is to be protected.	The Pipeline used For Irrigation purpose should be saved or for any damage it should be repaired.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.
4	Compensation towards other property/ structural loss.	Well, Tubewells, Canals should be compensated fairly.	Compensation for affected properties shall be provided after

			valuation/assessment by Competent Authority.
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Date : 18-07-21	Chainage :
Location : MANDOTHI	Habitation :
Panchayat :	
Tehsil : BAHADURGARH	District : JHAJJAR
Supervisor Name: ROHIT AND RAMJIVAN YADAV	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Compensation for remaining small portion of land after acquisition.	Remaining part of land should also be compensated and the ownership of remaining land should be with the owners.	HRIDC shall acquire land as per requirement of the HORC project and the acquired land shall be under the possession of HRIDC.
2	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 5 crore per acres due to increase in Input cost.	Compensation for loss of land shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
3	Compensation towards other property/ structural loss.	Well, Tubewells, Canals should be compensated fairly.	Compensation for affected properties shall be provided after valuation/ assessment by Competent Authority.

Date : 18-07-21

Chainage :

Location : JAKHODA		Habitation :	
Panchayat :			
Tehsil : BAHADURGARH		District : JHAJJAR	
Supervisor Name: ROHIT AND RAMJIVAN YADAV			
S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Issues regarding obstruction of waterdrainage line and canal system.	A separate line for drainage system from canal is requested.	Adequate waterway bridges/drainage facilities will be provided for drainage of storm water as per design.
2	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 6 crore per acres due to increase in Input cost.	Compensation for loss of land shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
3	Compensation towards other property/ structural loss.	Well, Tubewells, Canals should be compensated fairly.	Compensation for affected properties shall be provided after valuation/ assessment by Competent Authority.
4	Provision of access road for easy transportation and communication.	Request for provision of access road to remaining land in between KMP and proposed rail alignment.	Road may be provided as per

			requirement. Land will be acquired after award.
5	Employment Opportunity to landloosers.	Job opportunity asper eligibility for Project Affected families.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
6	Provision of public access road.	At least 33 ft road for public use should be given near rail line.	Road may be provided as per requirement. Land will be acquired after award.

Date : 18-07-21	Chainage :
Location : NILOTHI	Habitation :
Panchayat :	
Tehsil : BAHADURGARH	District : JHAJJAR
Supervisor Name: ROHIT AND RAMJIVAN YADAV	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Employment Opportunity to land losers.	Job opportunity as per eligibility for Project Affected families.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.
2	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 5 crore per acres due to increase in Input cost.	Compensation for loss of land shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
3	Compensation towards other property/ structural loss.	Well, Tubewells, Canals should be compensated fairly.	Compensation for affected properties shall be provided after valuation /assessment by Competent Authority.
4		Like KMP royalty should be given for 33 years.	In addition to the compensation for loss of land, the affected family will have the option to opt

			for annuity or one-time financial assistance.
5	Assurance to non-obstruction and safety of water ways.	Water flow should not be affected and it should be ensured.	Adequate waterway bridges/drainage facilities will be provided for drainage of storm water as per design.
6	Provision of additional access road.	From Kolasi road to Station public road should be provided.	Road may be provided as per requirement. Land will be acquired after award.
7	Fair and equal	Compensation for entire	Compensation for land

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
	compensation rate to all.	Bahadurgarh Tehsil should be same.	acquisition shall be provided as per RFCTLARR Act, 2013.

Date : 19-07-21	Chainage :
Location : KHERI JASOR	Habitation :
Panchayat :	
Tehsil : BAHADURGARH	District : JHAJJAR
Supervisor Name: Rohit and RamJivan Yadav	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	As same land is coming under Delhi-Katra route for Highway as well as for proposed HORC project so both compensation should be fairly given.	Compensation from both project proponent parties should be made.	Compensation for land acquisition shall be provided as per RFCTLARR Act, 2013.
2	In some section full acquisition of land along with structure will be taken for which assistance is required by project proponent.	Assistance to full Resettlement.	Resettlement assistance shall be provided as per RFCTLARR Act, 2013.
3	Demand for fair and equal compensation.	Same compensation to be made from Kundli to Palwal.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013
4		Like KMP royalty should be given.	In addition to the compensation for loss of land, the affected family will have the option to opt for annuity or one-time financial assistance.

5	Compensation towards otherproperty/ structural loss.	Well, Tubewells, Canals should be compensated fairly.	Compensation foraffected properties shall be provided aftervaluation/ assessment by Competent Authority.
6	Minimum rate for compensation	Minimum Land Rate should be 5 crore per	Compensation for loss of land shall be

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
	towards loss of land.	acres due to increase in Input cost.	provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
7	Fair and same compensation rate.	Rate of Land close to KMP and railway for Agriculture Land must be same.	Compensation for land acquisition shall be provided as per RFCTLARR Act, 2013.
8	If Fair Rate is not provided farmer will oppose the project.	Fair compensation rate to all must be released.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013
9	Land should be given for entire village.		Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013. No provision for providing the land.

Date : 21/07/2021.	Chainage :
Location : ChateraBahadurpur	Habitation Panchayat :
Tehsil : Sonipat	District : Sonipat
Supervisor Name: Rohit and RamJivan Yadav	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Presence of authority from Revenue department.	During the time of compensation a Government authority from the revenue department must be present for transparency.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
2	Require One time Full Compensation.	Remaining land after acquisition also to be acquired by Government & Compensation to be paid fully.	HRIDC will acquire land as per requirement for HORC project. Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
3	Compensation for demolition of house	Compensation request towards adjoining structures w.r.t affected structures which are also going to be affected as a result of demolition process.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
4	Provision of access road.	After land acquisition access road should be provided to the main road from the remaining every land.	Access road shall be provided as per local requirement.
5	Stamp duty and other expenses while utilization of compensation	To be study and revised.	Compensation for acquisition of land shall

	money for other alternatives should be bore by Government.		be provided as per RFCTLARR Act,2013.
6	Earliest One time compensation.	Compensation should bereleased to the PAFs on immediate basis.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013. HRIDC may consider.

7	<p>As per land record money to be released to the true land owner to</p> <p>avoid any fight between the beneficiaries and mischiefs.</p>	<p>Compensation Part must be handled by Government in case</p> <p>of multiple owners.</p>	<p>Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013</p> <p>to the actual owner of the land.</p>
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Date : 21-07-21	Chainage :
Location:	habitation:
Panchayat:	Sonipat District...Sonipat
Tahsil:	

S.N o.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	<p>Compensation to be also met for tree and structure affected</p> <p>along with affected land separately.</p>	<p>Required Compensation as per girth size of tree.</p>	<p>Compensation for acquisition of land and structure shall be provided as per RFCTLARR Act, 2013.</p> <p>Compensation for affected trees in private land shall be paid as per the evaluation made by a Valuer appointed by CALA.</p>
2	<p>As it is difficult to manage and utilize a small portion of remaining land on both side of the alignment so villagers want full acquisition of land with full compensation.</p>	<p>Remaining land after acquisition should also be overtaken by Government and compensation for the same should be made.</p>	<p>HRIDC will acquire land as per requirement for HORC project.</p>

3	<p>Proposal of infrastructure development to be made by the project proponent.</p>	<p>Proper Road connectivity and infrastructure development in streamline with Urban area.</p>	<p>Road crossings may be provided with RUB/ROB as per the importance of the road.</p>
4	<p>PAFs should be provided land where they can earn livelihood.</p>	<p>Land in lieu of beneficial land.</p>	<p>No provision for land for land.</p>

5	Required necessary facilities & employment opportunities.	Provision of new employment opportunity for PAFs in lieu of this proposed project.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.
6	Other Land Area from Government Land should be given to daily workers, they will do farming and fair MSP should be given to such farmers exclusively.		Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.

Date	: 22-07-21	Chainage	:
Location	: Harsana khurd	Habitation	:
Panchayat	:	District	: Sonipat
Tehsil	: Sonipat		

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Additional compensation should be given for fisheries, house, other structures like well, tube well, wire-fencing, garden, cowshed etc. should be compensated fairly.	Compensation for every affected property after identification shall be done.	All private affected structures like Well, Tube well, Wire-Fencing, Garden, Cow shed etc shall be compensated based on valuation of the structure.
2	Loss of livelihood for some land owners as source of only income is the land which is proposed to be acquired thus will affect them.	Livelihood restoring should be promoted by the project proponent by providing employment opportunities to the PAFs	The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.

		and other programmes maybe also promoted.	
3	The proposed project will affect theaccess road for people for public movement.	Provision for service road must be proposed for easy transportation accessibility.	Service road may be provided as per requirement. Pipelines crossing

			<p>the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.</p>
4	Request to proposed station at their village.	<p>Villagers believe that a station in their village will boost their economic as well as employment opportunities and other business profits.</p>	<p>Stations are proposed as per requirement of the HORC project.</p>
5	The remaining small portions of land on both side of the alignment are useless to the farmers so want it to be also acquired.	<p>Remaining land after acquisition should also acquire by Government and compensation for the same should be made.</p>	<p>HRIDC will acquire land as per requirement for HORC project. If required, access road facility shall be provided for the unacquired land.</p>
		<p>The project proponents should search an alternative</p>	<p>The alignment has been conceived on Techno-Economic Consideration like future passenger traffic, freight traffic and interconnectivity to other existing and</p>

6	Request for reroute/ change in proposed alignment designed.	to avoid residence area & productive land.	future railway corridors. However, HRIDC is trying to minimize land acquisition and resettlement issues. Wherever it is not
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			possible adequate compensation shall be provided as per RFCTLARR,Act,2013
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Date	: 22-07-21	Chainage	:
Location	: Harsanakalan	Habitation	:
Panchayat	:		
Tehsil	: Sonipat	District	: Sonipat

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Land in lieu of fertile and productive land near to village.	Project affected farmers should be provided Plot where they can earn livelihood.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013. No provision for land for land.
2	Loss of livelihood for some land owners as source of only income is the land which is proposed to be acquired thus will affect them.	Livelihood restoring should be promoted by the project proponent by providing employment opportunities to the PAFs and other programmes maybe also promoted.	The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.

<p>3</p>	<p>Additional compensation should be given for fisheries, house, other structures like well, tube well, wire-fencing, garden, cowshed etc. should be compensated fairly.</p>	<p>Compensation for every affected property after identification shall be done.</p>	<p>All private affected structures like Well, Tube well, Wire-Fencing, Garden, Cow shed etc shall be compensated based on valuation of the structure.</p>
<p>4</p>	<p>Authority of service road to Panchayat</p>	<p>Governing service road should be handover to</p>	<p>Road crossings may be provided with</p>

	committee	Panchayat.	RUB/ROB as per the importance of the road.
5	<p>The remaining portions of land after acquisition are useless to the farmers so</p> <p>want it to be also acquired with faircompensation.</p>	<p>Remaining land after acquisition should also acquire by Government andcompensation for the same should be made.</p>	<p>HRIDC will acquire land as per requirement forHORC project.Compensatio nfor acquisition of land shall be provided as per RFCTLARR Act, 2013.</p>

Date	: 21/07/2021	Chainage	:
Location	: Narsinghpur Bangar	Habitation Panchayat	:
Tehsil	: Sonipat	District	: Sonipat
Supervisor Name: Rohit and RamJivan Yadav			

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Issue regarding restoration of affected bore.	Borewell with electric connection should be provided by government.	Compensation will be provided after valuation of affected structure.
2	Provision of Access roads from every affected land plots.	Villagers require access road to agriculture field and main road/highway.	Access road may be provided as per requirement.
3	Agri Training to affected districts and employment opportunities to PAFs.	Free agri training to all affected district must be provided. Employment opportunities to 1 person per project affected families.	The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition. Training for restoration of livelihood of affected persons shall be provided.
4	The remaining portions of land after acquisition are useless to the farmers so want it to be also acquired with fair compensation.	Remaining land after acquisition should also acquire	HRIDC will acquire land as per requirement for HORC project. Wherever required, access road will be

		by Government and compensation for the same should be made.	provided for use of general public.
5	Confirmation of portion of land which will be acquired as per LAP.	HRIDC does confirm which portion of land is as per LAP will be acquired. Need a clearance at earliest.	The detail of land to be acquired shall be published in 20E gazette notification.
6	Earliest One time compensation.	Compensation should be released to the PAFs on immediate basis.	Compensation for acquisition of land shall be provided as per

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			RFCTLARR Act,2013by CALA.

Date : 21/07/2021	Chainage:
Location : Nahra	Habitation Panchayat :
Tehsil : Sonipat	District: Sonipat
Supervisor Name: Rohit and RamJivan Yadav	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	In some section remaining land is left on both side of the proposed alignment where land is proposed to be acquired through middle.	Land after acquisition on both side of the track should provide a road for the farmers to easily accessible.	Access road may be provided as per requirement.
2	Compensation as per Gale must be met.	Gale India bought land at the rate of Rs.2.90 crores per acre so they want compensation on the same terms.	Compensation for acquisition of land shall be provided as per RFCTLARR Act,2013.
3	Agri Training to affected districts and employment opportunities to PAFs.	Free agri training to all affected district must be provided. Employment opportunities to 1 person per project affected families.	Training for restoration of livelihood of affected persons shall be provided. The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.

4	Royalty on our land should be properly given.		<p>In addition to the compensation for loss of land, the affected family will have the option to opt</p> <p>for annuity or one time financial assistance.</p>
5	<p>Confirmation of which portion of land will be acquired as HRIDC does confirm which portion of land will be acquired as per LAP.</p>	<p>A Clear LAP is being asked by people to identify their Survey Nos</p>	<p>To be published in 20E gazette notification.</p>

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
6	Additional compensation should be given for fisheries, house, and other structures like well, tube well, wire-fencing, garden, cowshed etc. should be compensated fairly.	Compensation for every affected property after identification shall be done.	Compensation shall be provided after valuation/assessment of property by Competent Authority as per RFCTLARR Act, 2013.

Date : 21/07/2021	Chainage :
Location : Akbarpur Barota	Habitation Panchayat :
Tehsil : Sonipat	District : Sonipat
Supervisor Name : Rohit and RamJivan Yadav	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Provision of access road for easy transportation and communication.	Request for provision of access road to remaining land in between KMP and proposed rail alignment.	Access road may be provided as per requirement.
2	Minimum rate for compensation towards loss of land.	Minimum Land Rate should be 6-7 crore per acre due to increase in input cost.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.
3	Compensation for remaining small portion of land after acquisition.	Remaining part of land should also be compensated and the ownership of remaining land should be with the owners.	Compensation shall be given as per RFCTLARR Act, 2013 only for the acquired land and the same land will be under the possession of project proponent.

4	Royalty should be provided on the basis of KMP.		<p>Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013.</p> <p>In addition to the compensation for loss of land, the affected family will have the option to opt</p>
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			for annuity or one time financial assistance.
5	Request for additional facility.	Electricity Line must be shifted. Government must ensure supply of water, pipelines etc. sources.	<p>If electricity line is damaged due to construction, it will be repaired immediately.</p> <p>Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.</p>
6	Employment Opportunity to land losers for income restoration.	Job opportunity as per eligibility for Project Affected families.	<p>The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition.</p> <p>Training for restoration of livelihood of affected persons shall be provided.</p>

Date : 21/07/2021	Chainage :
Location : Malha Majra	HabitationPanchayat :
Tehsil : Sonipat	District : Sonipat
Supervisor Name: Rohit and RamJivan Yadav	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
1	Full assistance to new land with all facilities for PAFs whose maximum portion of land are proposed to be acquired or those who arecompletely losing land.	New land in lieu of acquired land with Proper electricity, water supply for each farmer must be provided to all as per theresettlement.	Compensation for acquisitionof land shall be provided as per RFCTLARR Act,2013. No provision for land for land.
2	Full Compensation	The Pipelines, Bores etc. which are going to be affected due to the proposedproject are need to be compensated fully or shouldbe restored.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted beforeconstruction. If any other pipeline is damaged due to construction, it will be repaired immediately.
3	Compensation for remaining small portion of land after acquisition.	Remaining part of land should also be compensated and the ownership of remaining land should bewith the owners.	Compensation shall be given as per RFCTLARR Act,2013only for the acquired land and the same land will be under the possession of project proponent.
4	Minimum rate for compensation towards loss of	Minimum Land Rate should be 5 crore per acres	Compensation for acquisitionof land shall be provided as per

	land.	due to increase in Input cost.	RFCTLARR Act,2013.
5	Provision of access road for easy transportation and communication.	Request for provision of access road to remaining land in between KMP and proposed rail alignment.	Access road shall be provided as per local requirement.
6	Provision of properly designed storm water drainage system in RUB and parallel to the proposed	A well designed drainage system is requested by thepeoples in order to avoid flooding of nearby areas during rainy season and	Adequate waterway bridges/drainage facilities will be provided for drainage ofstorm water as per design.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
	alignment.	damage to agricultural crops.	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Bhirawati- 30.08.2021			
1	Fair and transparency in compensation process	Require fair and transparency in compensation process through proper Government Policy.	Compensation shall be as per RFCTLARR Act, 2013
	Acquisition of remaining land	Villagers want the remaining portion of land also to be acquired by Government & Compensation to be paid fully on one time basis.	Land will be acquired as per requirement for HORC project and compensation shall be provided as per RFCTLARR Act, 2013.
3	Compensation of land to the true land owner.	In order to avoid this issue, a verification process of landowner as per land record shall be carried out by Government in case of multiple owners.	In case of multiple owners, landowner shall be verified as per land record available with Government and compensation shall be provided to true land owners after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013
4	Access road facility	Access road to everyland part is required for remaining land after acquisition.	Access road may be provided as per requirement.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Udaka-29.8.2021			
1	Remaining Land should overtake by HRIDC.	The remaining Land after acquisition is very less on which no profit from agriculture can be earned so it is requested to overtake whole land and pay the compensation based on market rate.	Land will be acquired as per requirement for HORE project and compensation shall be provided as per RFCTLARR Act, 2013.
2	Access to the agricultural land	For accessibility to other side of agricultural land or farm land proper access road & over bridge is required.	Access road and Road crossings with RUB/ROB may be provided as per requirement.
3	Employment	Preference should be given to local people during construction phase.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.
4	Fair compensation for farmer assets.	Fair compensation is required for loss of farmer assets.	Compensation for acquisition of land shall be provided after valuation/assessment of the property by Competent Authority as

			per RFCTLARR Act, 2013.
5	Required land for land.	Assurance to Gram Panchayat for land for land compensation.	Compensation for acquisition of land shall be provided as per RFCTLARR Act, 2013. No provision for land for land.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Atta-29.08.2021			
1	Compensation for any damage to water source or line & electricity.	The proposed alignment is likely to affect water pipeline & source along with electrical connection in these areas. So, requested to take care of the effect with layout of new water pipeline support from HRIDC & electricity connection.	Compensation for affected properties shall be provided after valuation/assessment by Competent Authority. Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel and very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.
2	Access road	Require access road for all location and nearby villages. Proposed pakka access road wherever necessary.	Access road may be provided as per requirement.
3	Government Job	Required job in railway for at least one member of affected family.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.

4	Employment for local people	Preference should be given to local people during construction phase.	<p>The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition.</p> <p>However, contractor may consider local people for employment opportunity during construction based on requirement of the project.</p>
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5	Acquisition of remaining land after acquisition.	Remaining land parcel is not useful for the farmer so they want Government to take whole land.	Land will be acquired as per requirement for HORC project.
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Indri-29.08.2021			
1	Land in Lieu of Land		No provision for land for land.
2	A major setback in agriculture yield for each farmer.	Loss of income should be converted into employments opportunities	The employment will be given as per government policy. Currently there is no provision of providing Govt. job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.
3	Employment opportunity in lieu of this development	Required necessary facility & job for our village and villager youth.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.
4	Utilization of non-governmental land.	Other Land Area apart from Government Land should be given to daily workers for farming and fair MSP should be given to such farmers exclusively.	No provision for land for land.

5	Infrastructure	Proper connectivity infrastructure development in streamline	Road an Proper access road may be provided as per requirement.
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
		with Urban area.	

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Khanpur-29.08.2021			
1	Stagnant water problem in underpass/ bridges during rainy season.	During rainy season water used to flood in underpasses due to poor drainage design and maintenance, so it is requested to proposed the project with proper design. In addition track height of the proposed rail alignment should be such that runoff water/rainwater does not enter into the agriculture fields.	The alignment has been conceived considering the environment and climate resilience adaptation measures. Adequat ewaterway bridges/drainage facilities will be provided for drainage of rainwater as per design.
2	No interruption to access transportation and existing travel service in the area during construction as well as on operation phase.	During construction new access route can be proposed keeping in view of minimum distance to access services. Also necessary Road Crossing can be proposed with new access roads wherever required.	Access road and Road crossings with RUB/ROB may be provided as per requirement.
3	Provision of Fencing in and near the station	In order to avoid any accidents to be incurred with human and cattle.	Safety fencing at the station may be provided as per requirement.

4	Affect of water pipeline.	The propose alignment is likely to affect the existing water pipeline as a result of the intersection. So it is requested to protect the water pipeline or find other solution.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel & very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
			repaired immediately.
5	Market rate for this village is 2.5- 3.0 Crore/Acre.	Compensation required as per the market rate.	Compensation for acquisition of land shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013.
6	Provision of railway station at the village.	It is request by villagers to proposed railway station at Khanpur for easy transportation.	Stations are proposed as per traffic demand and other technical considerations.
7	Land Deviation	It is requested if possible to have a look again on land in order to maintain minimum land deviation.	The alignment has been conceived on Techno-Economic Consideration like future passenger traffic, freight traffic and inter connectivity to other existing and future railway corridors. However, HRIDC is trying to minimize land acquisition and resettlement issues.

8	Service Road for public movement	Service road for irrigation facility and pipeline should be given.	<p>Service road may be provided as per requirement.</p> <p>Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel & very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.</p>
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Rewasan-30.08.2021			
1	Provision of Land/Plot for livelihood	Project affected farmers should be provided land/plot where they can earn livelihood	Compensation to project affected families/farmers shall be provided as per RFCTLARR Act,2013. No provision for providing the plot/land. However, training shall be provided for livelihood restoration.
2	Employment and restoration of livelihood	Loss of income should be converted into employment opportunities or other restoration programmes is suggested to propose.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project. Training shall be provided for livelihood restoration.
3	Compensation for affect of Structures like Well, Tube well, Wire-Fencing, Garden, Cowshed etc.	Proper Cowsheds or compensation in lieu which will be useful to construct a new cowshed.	Compensation shall be paid for affected structures after valuation by Competent Authority.
4	Authorship of service road	Service road should be governed & handover to panchayat, over or bridged require for footway and provisional road for transportation over railway line.	Service road and road crossings with RUB/ROB may be provided as per requirement.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Kherli Kankar- 30.08.2021			
1	Affected bore well.	Government should provide bore well with electric connection if it is affected due to the proposed project.	Compensation for affected properties shall be provided after valuation/assessment by Competent Authority. No provision of providing bore well.
2	Access to road facility	Villagers require access road to remaining part of agriculture field and main road/highway after acquisition of land.	Access road may be provided as per requirement.
3	Free Agricultural Technic Training	Free training for educated farmers and job opportunity in the project.	The employment will be given as per government policy. However, contractor may consider local people for employment opportunity during construction based on requirement of the project. Training on agricultural technology to farmers may be considered as livelihood restoration /income generation programme.
4	Acquisition of remaining part plot	Government should acquire remaining part of land and provide fair compensation.	HRIDC will acquire land as per requirement for HORC project. Wherever required, access road will be provided for use of remaining land parcel.

5	Payment of compensation	Compensation for loss of land and structure should be paid to affected families in one time.	Compensation shall be provided after valuation/assessment of the property by Competent Authority. Competent Authority may consider for one time payment.
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S. No.	Issues	Concerns/ suggestions Made by villagers	HRIDC Remark
RojkaMeo- 29.08.2021			
1	Access Road Facility	A Metal Road to Main road, Highways and remaining portion of land should be proposed.	Wherever required , access road will be provided for use of remaining land parcel.
2	Employment in Railways	Employment opportunities in railway as per qualification to one person per affected family must be given.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project
3	Employment opportunities during construction	Local people should be considered for employment during construction of the project.	Contractor may consider local people for employment opportunity during construction based on requirement of the project.
4	Free training for educated farmers	Training on agritech and other livelihood program to farmers and local youth must be proposed.	Training shall be provided for income restoration.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Meraula- 29.08.2021			
1	Free training and employment benefit	Free training to educated and uneducated farmer should be given. Also job opportunity in the project must be given to at least one person per affected family.	The employment will be given as per government policy. However, contractor may consider local people for employment opportunity during construction based on requirement of the project. Training shall be provided to project affected persons for income restoration.
2	Sharing of project benefits	Royalty on our land should be properly given.	No Royalty on Land is given. Compensation for loss of land to the affected family will be paid by Competent Authority as per RFCTLARR Act, 2013.
3	Fair compensation for affected structures and Trees.	Fair compensation for affected structures and Trees should be given. Provision of cowshed should be proposed.	Compensation shall be paid for affected structures after valuation by Competent Authority. No provision of providing plot for Cowshed
4	Access to road facility	A proper road should be given to access our lands.	Access road may be provided as per requirement
5	Compensation for damage of any structure/public utility	Electricity Line must be shifted. Government must ensure supply of water, pipelines etc. sources	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel & very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Rupaheri- 29.08.2021			
1	Provision of access road.	Request for provision of permanent access road for easy transportation and communication to remaining land during and after construction phase.	Wherever required, access road will be provided for use of remaining land parcel.
2	Income Restoration	Employment on the basis of eligibility and training in different fields for income restoration should be provided.	The employment will be given as per government policy. However, contractor may consider local people for employment opportunity during construction based on requirement of the project. Training for capacity building of PAPs shall be provided for income restoration.
3	Fair compensation	Fair compensation must be given to every PAPs for loss of agricultural land.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFLARR Act, 2013

S.No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Khor- 31.08.2021			

1	Compensation for remaining part of land after acquisition.	Fair compensation for remaining part of land which are economically not viable after acquisition of major portion of the same plot should be given.	HRIDC will acquire land as per requirement for HORC project. However, access road may be provided for use of remaining land parcel.
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2	Service road for transport and irrigation facility.	<p>Service road should be governed & handed over to panchayat.</p> <p>Provision of over bridge over railway line and for access to irrigation facility should be provided.</p>	Service road and road crossings with RUB/ROB may be provided as per requirement.
3	Demand of Railway station at village.	Railway Station should be proposed in some villages.	Stations are proposed as per traffic demand and other technical considerations.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Sehsola-31.08.2021			
1	Compensation for affected Structure, affected land, Tree, Tube-well, electric connection	Fair compensation for affected structure, loss of land, Tree, Tube-well, electric connection should be provided.	Compensation shall be paid for each affected structure after valuation by Competent Authority.
2	Searching of alternative route to avoid land acquisition	Alternative route should be considered to avoid acquisition agricultural land.	After considering different alternatives the proposed alignment has been finalized. Land will be acquired as per requirement for HIRC project and fair compensation shall be provided as per RFTLARR Act, 2013.

3	Government service in lieu of Land.	Govt. service in railway should be provided people loss their land.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition in the proposed project. However, contractor may consider
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Sehsola-31.08.2021			
			local people for employment opportunity during construction based on requirement of the project and training shall be provided to land looser for their livelihood restoration and income generation.
4	Compensation for remaining part of land after acquisition.	Either remaining land should be acquired by HRIDC or access road for remaining agriculture field should be given.	HRIDC will acquire land as per requirement for HOCR project. Wherever required, access road will be provided for use of remaining land parcel.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Dhulawat- 30.08.2021			
1	Accessibility to service road	Required service road on both side of railway line.	Wherever required, service road will be provided.
2	Onetime payment of compensation	Compensation should be paid fully in one time.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013. Competent Authority may consider for onetime payment of compensation.

3	Remaining land acquisition and access to road facility	Remaining land should also be acquired by HRIDC or give the accessroad to remaining land/agriculture field.	HRIDC will acquireland as per requirement for HORC project. Wherever required, accessroad will be provided for use of remaining land
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Dhulawat- 30.08.2021			
			parcel.
4	Job in railway as per qualifications	Project affected persons should be provided job in railways as per qualification.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Binduwas- 31.08.2021			
1	Drainage system	Drainage system require for proper run off water as it spoiling nearby area/agriculture area.	Adequate waterway bridges/drainage facilities will be provided for drainage of rainwater as per design.
2	Proper access to village road	Proper accessibility to village road should be provided. Metal road should be proposed to access village.	Access road may be provided as per requirement.

3	Employment Opportunity	Employment required for local people during construction phase.	Contractor may consider local people for employment opportunity during construction based on requirement of the project.
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Binduwas- 31.08.2021			
4	Provision of cash payment	Cash payment should be provided for acquired land.	No provision of cash. Compensation shall be provided in the bank account by Competent Authority as per RFCTLARR Act, 2013.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Padheni- 30.08.2021			
1	Land in lieu of land.	Government should provide land in lieu of land.	No provision of land in lieu of land. However, fair compensation shall be provided by Competent Authority as per RFCTLARR Act, 2013
2	Permanent employment	Government should provide job opportunity to at least one member of each affected families.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.
3	Provision of access road	Access road should be provided to access the agricultural field.	Access road may be provided as per requirement.

4	Onetime payment	Compensation should be paid fully in one time.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013. Competent Authority may
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Padheni- 30.08.2021			
			consider for onetime payment of compensation.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Gobjka- 30.08.2021			
1	Education facility in the area.	Education facility should be provided in the affected area.	Decision on providing education facility in the area does not falls under the purview of HRIDC.
2	Provision of new water pipeline for remaining land	The affected water line should be repaired or diverted for any inconvenience prior to project construction.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel & very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately
3	Provision of medical benefit assistance	Permanent medical assistance should be provided to affected persons in project area.	There is no provision of providing the medical facility.
4	Assistance to essential infrastructure facility	Access Road /Lights should be provided in the project area.	Access road may be provided as per requirement.

S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
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Kuliaka- 30.08.2021

1	Provision of pucca access road	Pucca access road should be linked to village.	Access road may be may be linked to the affected villages as per requirement.
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S. No.	Issue/Suggestion Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Kuliaka- 30.08.2021			
2	Provision of medicals facility for affected families.	Provision of medical facility for affected families is required.	Providing medical facility in the area does not falls under the purview of HRIDC.
3	Fair compensation	Compensation should be satisfactory to support livelihood of the affected people.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013
4	Provision of education facilities	Proper educational facilities are required in project affected villages.	Decision on providing education facility in the area does not falls under the purview of HRIDC.

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Goela- 30.08.2021			
1	Requirement of Underpass	Provision for underpass and access road opposite /adjacent to other side of agricultural land should be proposed for easy access & mobility.	Access road and road crossings with RUB/ROB may be provided as per requirement.

2	Employment opportunity	Employment should be given to at least one member of each affected family.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Goela- 30.08.2021			
3	Provision of access road	After land acquisition proper access road should be provide by Govt.	Access road may be provided as per requirement.
4	Provision of medical facilities and Job for woman.	Proper medical facility and Job for woman should be considered in project affected area.	Decision on providing medical facility in the area does not falls under the purview of HRIDC. Contractor may consider local people particularly women for employment opportunity during construction based on requirement of the project.

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Dingerheri-31.08.2021			
1	Access road to agriculture farm	Access road to agriculture farm should be provided.	Access road may be provided as per requirement.
2	Employment for local people during construction	Employment required for local people during construction phase and preference should be given to locals first.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may give preference to local people during construction based on requirement of the project.

3	Compensation at market value	Compensation is required as per current market rate.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Dingerheri-31.08.2021			
			RFCTLARR Act, 2013

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Sabras- 30.08.2021			
1	Provision of Borewell with electric connection	Borewell with electricity connection should be provided by the government.	Compensation for affected properties shall be provided after valuation/ assessment by Competent Authority. No provision of providing bore well. Only affected bore well will be compensated.
2	Access to road facility	Villagers require access road to agriculture field and main road/highway.	Access road may be provided as per requirement.
3	Consideration of equal compensation	Same compensation rate should be considered for all PAFs.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013
4	Acquisition of remaining land by HRIDC	If 80% land is acquired by HRIDC than farmers what will be done for remaining land. HRIDC should acquire remaining part of land.	HRIDC will acquire land as per requirement for HORC project. Wherever required, access road will be provided for use of remaining land parcel.

5	Employment in Railway	Job in Railway should be offered to at least one member in each affected family.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Sabras- 30.08.2021			
			consider local people for employment opportunity during construction based on requirement of the project.
6	Ownership of remaining part of land	Remaining Land part should be compensated and it should remain under the ownership of land owners.	HRIDC shall acquire land as per requirement of the HOCR project and the acquired land shall be under the possession of HRIDC.

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Kalwari- 30.08.2021			
1	Provision of providing plot	New Plot with proper electricity and water supply should be provided to each affected families	Compensation shall be paid for affected families after valuation by Competent Authority as per RFCTLARR Act, 2013. No provision of providing plot to affected families.
2	Drainage system	Drainage system is required for proper runoff water as it may spoil nearby area/agriculture area.	Drainage facilities will be provided as per design.

3	Compensation for demolition of structure	Adequate compensation should be provided for demolition of structures.	Compensation shall be paid for affected structures after valuation by Competent Authority.
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S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Kalwari- 30.08.2021			
4	Releasing of compensation money	Compensation should be released to the PAFs on immediate basis.	Compensation shall be provided by Competent Authority after verification and assessment of affected properties.
5	Land in Lieu of Land	land in lieu of fertile land should be given to PAFs.	Compensation shall be paid for affected families after valuation by Competent Authority as per RFCTLARR Act,2013. No provision of providing land in lieu if land.
6	Income generation for daily workers	A Land plot from Government land should be given to daily workers for farming and fair MSP should be given to such farmers exclusively	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act,2013. No provision of land for land. Training on income generation may be provided to daily workers if they are affected by the project.

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Maindla- 31.08.2021			

1	Fair and equal compensation.	As the rate in nearby villages is high so compensation rate should be equal in all villages.	Compensation shall be provided after valuation/assessment of the property by Competent Authority as per RFCTLARR Act, 2013
2	Access road facility	Provision of new road / temporary access road	Access road may be provided as per requirement.

S. No.	Issue Raised by villagers	Specific suggestion Made by villagers	HRIDC Remark
Maindla- 31.08.2021			
		should be made during construction period. Access to transportation communication or road should not be interrupted.	
3	Land in lieu of beneficial land.	PAFs should be provided land where they can earn livelihood.	Compensation to project affected families shall be provided by the Competent Authority as per RFCTLARR Act,2013. No provision of providing the plot/land. However, training may be provided for income generation.
4	Proposal of new pipeline for irrigation	New Pipelines with good condition need to be proposed if is damaged due to the project.	Pipelines crossing the proposed railway line in the project area will be protected suitably and pipelines running parallel & very close to alignment will be shifted before construction. If any other pipeline is damaged due to construction, it will be repaired immediately.
5	Job opportunities to PAFs	Provision of job in railway should be considered to at least one member of each PAFs.	The employment will be given as per government policy. Currently there is no provision of providing Govt. Job against land acquisition. However, contractor may consider local people for employment opportunity during construction based on requirement of the project.

Detail of Stakeholders in Proposed HORC Project

Government	<ul style="list-style-type: none"> ○ Ministry of Urban Development, GoI ○ Ministry of Finance, GoI ○ Ministry of Railways, GoI ○ Ministry of Civil Aviation, GoI ○ Ministry of Corporate Affairs, GoI ○ Ministry of External Affairs, GoI ○ Archeological Survey of India ○ Chief Minister Office, GoH ○ Chief Secretary Office, GoH ○ Department of Housing & Urban Planning, GoH ○ Home Department, GoH ○ Finance Department, GoH ○ Transport Department, GoH ○ Development Authority of Concerned Districts ○ Municipal Corporation of Concerned Districts ○ Forest & wildlife Department, GoH ○ State Pollution Control Board, Haryana ○ State Archeological Department, Haryana ○ Department of Labour, GoH ○ District Administration ○ Land Acquisition Officer of Concerned Districts ○ Concerned District Level Officials from Revenue Department o ○ IUCN, WWF ○ District Police of Concerned Districts ○ Public Works Department, GoH ○ Technical Education Department, GoH ○ Haryana State Minor Irrigation and Tube well corporation limited ○ Central Ground Water Authority/Board, Haryana Region ○ Haryana State Industrial and Infrastructure Development
Funding Agency	<ul style="list-style-type: none"> ○ The Asian Infrastructure Investment Bank (AIIB)
Media	<ul style="list-style-type: none"> ○ Hindustan Times ○ The Times of India The Pioneer ○ Indian Express ○ Hindustan ○ Dainik Bhaskar ○ Danilk Jagran ○ Rashtriya Sahara ○ Navbharat Times ○ Amar Ujala ○ India Today ○ Tribune
Commuter and passengers	<ul style="list-style-type: none"> ○ Employees ○ Passengers
Contractors	

Community	<ul style="list-style-type: none"> ○ Project Affected People ○ Resident Welfare Associations ○ Local Traders, Traders Association, ○ Haryana Petroleum Traders Association ○ Resident Welfare Association ○ Local Residences
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S. No	Name of NGO	Address
SONIPAT		
1	Akhil Bharatiya Manav Kalyan Samiti	Akhil Bharatiya Manav Kalyan Samiti, Ward no. 2, Shastri Nagar Kharkhoda, PIN CODE 131402
2	Excelsior Welfare And Empowerment Society	7,M.C. Market, Near PWD Rest House, Subhash Chownk, Sonapat-131001, Haryana
3	Gramin Swasthya Shiksha Avam Samaj Kalyan Samiti	H.No. 1726/31, Shastri Colony, Gohana Road, Sonipat, Haryana-131001
4	Gram Van Samiti	Gram Van Samiti, Village:-Chhatera Bahadurpur,Distt.-Sonipat (HR)-131103., Mob.No.09991197043,
5	Nari Uthan Kendra	H.NO.-555/26, West Ram Nagar
JHAJJAR		
1	Akhil Dehat Vikas Evm Neat Society Regd	Village & Post Office Ladrawan, Block Bahadurgarh, Distt. Jhajjar, , Haryana-124507
2	Indian Jagriti Manch	Indian Jagriti Manch, Saurabh House, Dawla - Jhajjar-124103 (Haryana)
3	All India Human Support Association - NGO	All India Human Support Association, V.P.O. Lowa Khurd (Noona Majra), Teh-Bahadurgarh, Dist- Jhajjar, Haryana-124507
4	Society For All Around Human Development Hr - NGO	59/5, Indra Park Near Ravidas Mandir, Line PAR Bahadargarh, Distt. Jhajjar pin code-124507
GURUGRAM		
1	Guru Nanak Sewa Sansthan	002 Residency Apartment, Tower A Ardee City Sector 52
2	IIMPACT	Iimpact, M 2/ 3 Ground Floor, DLF Phase 2
3	Literacy India	Literacy India, J-1365, Palam Vihar, Gurgaon, 122017
4	Lotus Petal Charitable Foundation	Plot No-3, Gali no -5 Beside Unitech House South City 1
5	Maxvision Social Welfare Society	774/2, Ashok Vihar, Phase-1, Gali No.2, Railway Station Road, Near Sneh Hospital.Gurgaon, Haryana-122001
6	VIDYA Integrated Development for Youth and Adults	Vidya Integrated Development for Youth and Adults Plot no. 3126, Block S, sector-24, DLF Phase III
7	Adhikaar The Rights Path	Adhikaar the rights path, B-301, Mianwali Colony, Gurgaon (Har)-122001
8	Centre For Cultures Technologies And The Environment	K 2/20, DLF Phase II
9	Divyajeevan Foundation	PD-75, malibu Towne, , Sohna Road, Haryana 122001
10	Energy Research Applications	Energy House, Plot No -294, Sector-39, Gurgaon-122001, Haryana

S. No	Name of NGO	Address
11	Gramin Mahila Vikash Samiti	Gali no V.P.O Bhangrola IMT Manesar Distt. Gurgaon Haryana Pin Code 122050
12	Gram Unnati Foundation	801A, 8th Floor, Welldone Tech Park, Sector 48, Gurgaon - 122 018
13	Humane Welfare Society	H. No.- 368/12, New Rly Road, Gurgaon - 122001 (Haryana)
14	Jan Chetna Avam Gram Vikas Samiti	Village Tajnagar, P.O. Patli Station, Disst. Gurgaon (Haryana)-122506
15	Mahila Jagarti Sabha	Rajiv Nagar, Gurgaon - 122001
16	Manav Utthan Mission	416, Aapka Bazar, Gurgaon (Haryana). Pin Code - 122001.
17	Ramraj Environment	Plot No. 264, Udyog Vihar, Phase-6, Sector-37, Gurgaon-122001, Haryana
18	Society For Education And Environmental Training	F 19A Sushant Lok 2 Sector 56 Gurgaon 122002
NUH (MEWAT)		
1	District Red Cross Society Nuh	First Floor ,Mini Secretariat, Nuh, Haryana 122107
2	Pragatishil Yuva Aggarni Sangathan	Village Madhi, Post Office Nagina, Tehsil Firozpur Jhirka, District Mewat (Haryana)-122108
3	Social And Economical Welfare Association	Ward No. 7 Near Bus Stand Nu Mewat (HR) 122107.
4	Society For Overall Rural Development Sord	Anil Bhardwaj, Society for Rural Development, Near Hindu Sr Sec School, Nuh, Mewat
PALWAL		
1	Jan Chetna Sewa Society	H.NO.-389/14,Gali. NO.-05, Shyam Nagar Palwal, PIN CODE-121102
2	Jan Kalyan Vikas Society	Lord Krishna College of Management & Technology, NH-2, OPP. Saraswati Mahila College, Rawat Bhawan, Palwal 121102 Haryana



hridc omtc <hridcomtc@gmail.com>

Consultation regarding RET/Endemic species/ Critical habitation site reg

2 messages

hridc omtc <hridcomtc@gmail.com>

Thu, Apr 1, 2021 at 5:57 PM

To: vivek.saxena@iucn.org

Cc: Pradeep Kumar <gmphridc@gmail.com>, adashridc@gmail.com

Bcc: arun.omtc@gmail.com, director@overseasmintech.com

Sir

As per telephonic conversation on dated 01.04.2021 regarding consultation on RET/Endemic species/ Critical habitation site in proposed HOCR project.

Please find the attached letter which is self explanatory. According to this letter, you propose to give some time out of your valuable time for consultation regarding the above issue.

Thanks & Regards

Dr. Nafeesh Ahamed
Overseas Min-tech Consultants
Jaipur

 **Letter to IUCN (1).pdf**
1663K

SINGH Rohit Kumar <Rohit.Singh@iucn.org>

Fri, Apr 2, 2021 at 1:43 PM

To: "hridcomtc@gmail.com" <hridcomtc@gmail.com>

Cc: "gmphridc@gmail.com" <gmphridc@gmail.com>, SAXENA Vivek <VIVEK.SAXENA@iucn.org>, SAXENA Aanchal <Aanchal.Saxena@iucn.org>

Dear Dr. Nafeesh

Greetings from IUCN India Country Office!

Let me introduce myself, I am Rohit Singh, Senior Project Associate IUCN India. I currently look into Business and Biodiversity theme for Business and infra projects.

In reference to the letter number -HRIDC/ESIA dated 26th March 2021(attached) regarding Consultation required RET/ Endemic species/ Critical habitation site and other environmental issue in connection with Haryana Orbital Rail Corridor from Palwal to Sonipat, we can have a virtual call to discuss the scope and the requirements from your side.

Please suggest two-three time slots in the coming week so that we can fix up an online meeting.

Looking forward to hear from you soon.

Best Regards,

Rohit Singh

[Quoted text hidden]

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 **Letter to IUCN (1).pdf**
1663K



हरियाणा रेल इन्फ्रास्ट्रक्चर डवलपमट कापारशन लिमिटेड
(हरियाणा सरकार और रेल मंत्रालय का संयुक्त उपक्रम)
Haryana Rail Infrastructure Development Corporation Ltd.
(A Joint Venture of Govt. of Haryana & Ministry of Railways)

No:HRIDC/ESIA/

Dt.26.03.2021

To
The Office In-charge
International Union for Conservation of Nature (IUCN)
4, Green Park Ext Road, Block-H,
Green Park Extension,
Green Park, New Delhi,
Delhi-110016.

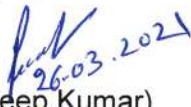
Subject: Consultation regarding RET/ Endemic species/ Critical habitation site and other environmental issue in connection with Haryana Orbital Rail Corridor from Palwal to Sonipat being executed by Haryana Rail Infrastructure Development Corporation (HRIDC).

Haryana Rail Infrastructure Development Corporation (A joint venture of Govt. of Haryana and Ministry of Railways) is executing Haryana Orbital Rail Corridor (HORC) project from Palwal to Sonipat (along KMP expressway). Land acquisition of the project is in progress.

A mandatory study on environmental and social impact assessment (ESIA) is required to be done by HRIDC as per funding agency (AIIB) policy guideline and other statutory requirements. In this connection HRIDC has appointed a consultant namely M/S Overseas Min-Tech Consultant, Jaipur (OMTC).

The consultant on behalf of HRIDC, will visit your office to discuss and take necessary information related to **RET/ Endemic species/ Critical habitation site and other environmental issue in connection with Haryana Orbital Rail Corridor from Palwal to Sonipat being executed by Haryana Rail Infrastructure Development Corporation (HRIDC).**

It is, therefore, requested to communicate suitable date & time to this office so that our consultant can meet and collect necessary information on the above subject.


(Pradeep Kumar)
IRSE officer of 1996 Batch
General Manager/Projects
HRIDC/Gurugram

CC: M/S Overseas Min-Tech Consultant, Jaipur (OMTC) for information and N/A.



hridc omtc <hridcomtc@gmail.com>

Consultation regarding RET/Endemic species/ Critical habitation site reg

SINGH Rohit Kumar <Rohit.Singh@iucn.org>

Fri, Apr 2, 2021 at 1:43 PM

To: "hridcomtc@gmail.com" <hridcomtc@gmail.com>

Cc: "gmphridc@gmail.com" <gmphridc@gmail.com>, SAXENA Vivek <VIVEK.SAXENA@iucn.org>, SAXENA Aanchal <Aanchal.Saxena@iucn.org>

Dear Dr. Nafeesh

Greetings from IUCN India Country Office!

Let me introduce myself, I am Rohit Singh, Senior Project Associate IUCN India. I currently look into Business and Biodiversity theme for Business and infra projects.

In reference to the letter number -HRIDC/ESIA dated 26th March 2021(attached) regarding Consultation required RET/ Endemic species/ Critical habitation site and other environmental issue in connection with Haryana Orbital Rail Corridor from Palwal to Sonipat, we can have a virtual call to discuss the scope and the requirements from your side.

Please suggest two-three time slots in the coming week so that we can fix up an online meeting.

Looking forward to hear from you soon.

Best Regards,

Rohit Singh

[Quoted text hidden]

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 **Letter to IUCN (1).pdf**
1663K



hridc omtc <hridcomtc@gmail.com>

regarding consultation

1 message

hridc omtc <hridcomtc@gmail.com>

Tue, Apr 6, 2021 at 6:02 PM

To: vivek.saxena@iucn.org, Rohit.Singh@iucn.org

Cc: Pradeep Kumar <gmphridc@gmail.com>, adashridc@gmail.com

Bcc: pratibhamedokomtc@gmail.com

Sir

As per mail dated 02.04.2021 regarding Consultation required RET/ Endemic species/ Critical habitation site and other environmental issues in connection with Haryana Orbital Rail Corridor from Palwal to Sonipat. Can the date for the online meeting for said issue be possible on April 07 at 2.30 AM and April 08 11.00 AM. In this regard, please intimate to us.

Regards

Dr. Nafeesh Ahamed



hridc omtc <hridcomtc@gmail.com>

Letter to IUCN - reg.

1 message

hridc omtc <hridcomtc@gmail.com>

Thu, Apr 8, 2021 at 1:09 PM

To: Pradeep Kumar <gmphridc@gmail.com>, adashridc@gmail.com, directorpp.hridc@gmail.com

Cc: arun.omtc@gmail.com, director@overseasmintech.com

Bcc: pratibhamedokomtc@gmail.com

Sir

A meeting with IUCN was conducted on 07.04.2021, and IUCN suggested that the consultant would give the list of the species found during the survey. In connection with this, please check the draft letter and duly signed by authority of HRIDC

and send it to IUCN along with the plant list to the following mail.

Mail Dr. Vivek Saxena (Country Representative IUCN): vivek.saxena@IUCN.org

Copy to Rohit Singh (IUCN): Rohit.Singh@iucn.org

Thanks and Regards

Dr. Nafeesh Ahamed

OMTC, Jaipur

2 attachments**Draft Letter__IUCN.docx**

25K

**Species identified in HRIDC project.pdf**

113K

08.04.1 2021

To

Dr. Vivek Saxena
Country Representative
International Union for Conservation of Nature (IUCN)
4, Green Park Ext Rd, Block H,
Green Park Extension,
Green Park, New Delhi,
Delhi 110016

Project:

Haryana Orbital Rail Corridor (HORC) project in connection with Haryana Railway Infrastructure Development Corporation (HRIDC)

Dear Sir,

For kind information the proposed project from Upstream to downstream direction is covering a total distance of **143.93 Km** in 5 districts of Haryana, India viz., Sonipat, Jhajjar, Gurugram, Nuh & Palwal. Also for the said proposed project corridor a baseline study had been already conducted as core & buffer zone within 100 m & 5 km on each side of project influence area to collect one season data (winter season) on biological environment (Flora and Fauna list enclosed as Annexure-I).

On the basis of list of species found in the proposed study area as per AIIB (Asian Infrastructure Investment Bank) suggestion it is proposed to indicate the RET and endemic species as per IUCN along with environmental sensitive issue around the alignment, if any.

In this regard, a letter was send earlier to IUCN office for discussion on necessary information related to RET/ Endemic species/ Critical habitation site and other environmental issue along the proposed corridor & for which IUCN, Delhi and OMTC, Jaipur had a consultation meeting on 07.042021 at 3.30 pm. through VC. During the meeting, a discussion was held on project description, impact related to Flora and Fauna, RET/Endemic species and environmental issue. It was decided that, consultant will provided a list of species (Flora and Fauna) to IUCN which is found during the survey which is enclosed as Annexure-I.

We kindly request IUCN, Delhi to crosscheck the provided list for any possible RET/Endemic species & identify any critical habitation site or any environmental sensitive areas/ issues along the proposed alignment that might cause hindrance to the project as well as to the sensitive species. In this regard do provide us list of RET/Endemic species and buffer list of the critical habitation & environmental sensitive site if any.

Thanks and Regards
HRIDC

Table: List of Plant species recorded from study area (Core zone)

S. No.	Botanical Name	Local Name	Family	Habit	Division
1.	<i>Abutilon indicum</i>	Kangi	Malvaceae	H	D
2.	<i>Acacia auriculiformis</i>		Mimosaceae	T	D
3.	<i>Acacia farnesiana</i>		Mimosaceae	T	D
4.	<i>Acacia jacquemontii</i>	Babul	Mimosaceae	T	D
5.	<i>Acacia leacophloea</i>	Raunj	Mimosaceae	T	D
6.	<i>Acacia nilotica var. indica</i>	Kikar	Mimosaceae	T	D
7.	<i>Acacia senegal</i>	Khairi	Mimosaceae	T	D
8.	<i>Achyranthes aspera</i>	Chirchita	Amaranthaceae	H	D
9.	<i>Adhatoda vasica</i>	Bansa	Acanthaceae	S	D
10.	<i>Agava americana</i>	Keora	Asparagaceae	S	D
11.	<i>Ageratum conyzoides</i>		Asteraceae	H	D
12.	<i>Amaranthus gracilis</i>	Cholai	Amaranthaceae	S	D
13.	<i>Anogeissus pendula</i>	Dhauk	Combretaceae	T	D
14.	<i>Argemone mexicana</i>	Kanteli	Papaveraceae	H	D
15.	<i>Boswellia serrata</i>	Salai	Burseraceae	T	D
16.	<i>Bougainvillea sp.</i>		Nyctaginaceae	S	D
17.	<i>Calotropis procera</i>	Aak	Apocynaceae	S	D
18.	<i>Cannabis sativa</i>	Bhang	Cannabaceae	S	D
19.	<i>Capparis decidua</i>	Karir	Capparidaceae	S	D
20.	<i>Carissa spinarum</i>	Karunda	Apocynaceae	S	D
21.	<i>Cassia tora</i>	Panwar	Caesalpiniaceae	H	D
22.	<i>Cenchrus ciliaris</i>	Anjan	Poaceae	G	M
23.	<i>Chenopodium album</i>	Bathua	Amaranthaceae	H	D
24.	<i>Chrysopogon montanus</i>	Dhotu	Poaceae	G	M
25.	<i>Cordia dichroma</i>	Lasura	Boraginaceae	T	D
26.	<i>Cuscuta reflexa</i>	Aakash Bel	Cuscutaceae	C	D
27.	<i>Cynodon dactylon</i>	Doob grass	Poaceae	G	M
28.	<i>Dalbergia sissoo</i>	Shisham	Fabaceae	T	D
29.	<i>Datura alba</i>	Dhatura	Solanaceae	S	D
30.	<i>Digeria muricata</i>	Jungli Sag	Amaranthaceae	H	D
31.	<i>Eucalyptus sp.</i>	Safeda	Myrtaceae	T	D
32.	<i>Ficus benghalensis</i>	Barh	Moraceae	T	D
33.	<i>Ficus religiosa</i>	Peepal	Moraceae	T	D
34.	<i>Holoptelea intergrifolia</i>	Pahari Papri	Ulmaceae	T	D
35.	<i>Leucaena leucocephala</i>	Su-Babul	Fabaceae	T	D
36.	<i>Lantana camara</i>	Lantana	Verbenaceae	S	D
37.	<i>Melia azedarach</i>	Bakain	Meliaceae	T	D
38.	<i>Morus alba</i>	Toot	Moraceae	T	D
39.	<i>Parthenium hysterophorus</i>	Congress grass	Asteraceae	H	D
40.	<i>Phoenix sylvestris</i>	Khajur	Arecaceae	T	M

41.	<i>Phyllanthus niruri</i>		Euphorbiaceae	H	D
42.	<i>Physalis minima</i>	Rusbari	Solanaceae	H	D
43.	<i>Pongamia pinnata</i>	Papri, Karanj	Fabaceae	T	D
44.	<i>Prosopis cineraria</i>	Jand	Fabaceae	T	D
45.	<i>Prosopis glandulosa</i>	Vilayati Kikar	Fabaceae	T	D
46.	<i>Prosopis juliflora</i>	Vilayati Kikar	Fabaceae	T	D
47.	<i>Ricinus communis</i>	Arand	Euphorbiaceae	S	D
48.	<i>Saccharum spontaneum</i>	Kandera	Poaceae	G	M
49.	<i>Solanum nigrum</i>	Makoi	Solanaceae	H	D
50.	<i>Solanum xanthocarpum</i>	Kateli	Solanaceae	H	D
51.	<i>Syzygium cumini</i>	Jamun	Myrtaceae	T	D
52.	<i>Terminalia arjuna</i>	Arjun	Combretaceae	T	D
53.	<i>Tinospora cordifolia</i>	Giloi	Menispermaceae	C	D
54.	<i>Tribulus terrestris</i>	Gokhru	Zygophyllaceae	H	D
55.	<i>Vallisneria spiralis</i>	Dudhi	Apocynaceae	C	D
56.	<i>Withania somnifera</i>	Ashwagandha	Solanaceae	H	D
57.	<i>Xanthium strumarium</i>		Asteraceae	H	D
58.	<i>Ziziphus sp.</i>		Rhamnaceae	S	D

Table: List of Plant species recorded from study area (Buffer zone)

S. No.	Botanical Name	Local Name	Family	Habit	Division
1	<i>Abutilon indicum</i>	Kangi	Malvaceae	H	D
2	<i>Acacia auriculiformis</i>		Mimosaceae	T	D
3	<i>Acacia farnesiana</i>		Mimosaceae	T	D
4	<i>Acacia jacquemontii</i>	Babul	Mimosaceae	T	D
5	<i>Acacia leacophloea</i>	Ranj	Mimosaceae	T	D
6	<i>Acacia nilotica var. indica</i>	Kikar	Mimosaceae	T	D
7	<i>Acacia senegal</i>	Khairi	Mimosaceae	T	D
8	<i>Acacia tortilis</i>		Mimosaceae	T	D
9	<i>Achyranthes aspera</i>	Chirchita	Amaranthaceae	H	D
10	<i>Adhatoda vasica</i>	Bansa	Acanthaceae	S	D
11	<i>Agave americana</i>	Keora	Asparagaceae	S	D
12	<i>Ageratum conyzoides</i>		Asteraceae	H	D
13	<i>Ailanthus excelsa</i>	Ulloo Neem	Simaroubaceae	T	D
14	<i>Albizia lebbek</i>	Siris	Fabaceae	T	D
15	<i>Amaranthus gracilis</i>	Cholai	Amaranthaceae	S	D
16	<i>Anogeissus pendula</i>	Dhauk	Combretaceae	T	D
17	<i>Argemone mexicana</i>	Kanteli	Papaveraceae	H	D
18	<i>Bombax ceiba</i>	Semal	Bombacaceae	T	D
19	<i>Boswellia serrata</i>	Salai	Burseraceae	T	D
20	<i>Bougainvillea sp.</i>		Nyctaginaceae	S	D

S. No.	Botanical Name	Local Name	Family	Habit	Division
21	<i>Butea monosperma</i>	Dhak	Fabaceae	T	D
22	<i>Calotropis procera</i>	Aak	Apocynaceae	S	D
23	<i>Cannabis sativa</i>	Bhang	Cannabaceae	S	D
24	<i>Capparis decidua</i>	Karir	Capparidaceae	S	D
25	<i>Carissa spinarum</i>	Karunda	Apocynaceae	S	D
26	<i>Cassia tora</i>	Panwar	Caesalpiaceae	H	D
27	<i>Cenchrus ciliaris</i>	Anjan	Poaceae	G	M
28	<i>Chenopodium album</i>	Bathua	Amaranthaceae	H	D
29	<i>Chrysopogon montanus</i>	Dhotu	Poaceae	G	M
30	<i>Cordia dichroma</i>	Lasura	Boraginaceae	T	D
31	<i>Cucumis pubescens</i>	Kachri	Cucurbitaceae	C	D
32	<i>Cuscuta reflexa</i>	Aakash Bel	Cuscutaceae	C	D
33	<i>Cynodon dactylon</i>		Poaceae	G	M
34	<i>Cyperus rotundus</i>	Motha	Cyperaceae	G	M
35	<i>Dalbergia sissoo</i>	Shisham	Fabaceae	T	D
36	<i>Datura alba</i>	Dhatura	Solanaceae	S	D
37	<i>Digeria muricata</i>	Jungli Sag	Amaranthaceae	H	D
38	<i>Eucalyptus sp.</i>	Safeda	Myrtaceae	T	D
39	<i>Ficus benghalensis</i>	Barh	Moraceae	T	D
40	<i>Ficus glomerata</i>	Gullar	Moraceae	T	D
41	<i>Ficus religiosa</i>	Peepal	Moraceae	T	D
42	<i>Holoptelea intergrifolia</i>	Pahari Papri	Ulmaceae	T	D
43	<i>Leucaena leucocephala</i>	Su-Babul	Fabaceae	T	D
44	<i>Lantana camara</i>	Lantana	Verbenaceae	S	D
45	<i>Mangifera indica</i>	Aam	Anacardiaceae	T	D
46	<i>Melia azedarach</i>	Bakain	Meliaceae	T	D
47	<i>Mitragyna parvifolia</i>	Phaldu	Rubiaceae	T	D
48	<i>Moringa oleifera</i>	Sohanjna	Moringaceae	T	D
49	<i>Morus alba</i>	Toot	Moraceae	T	D
50	<i>Parthenium hysterophorus</i>	Congress grass	Asteraceae	H	D
51	<i>Phoenix sylvestris</i>	Khajur	Arecaceae	T	M
52	<i>Phyllanthus emblica</i>	Aamla	Euphorbiaceae	T	D
53	<i>Phyllanthus niruri</i>		Euphorbiaceae	H	D
54	<i>Physalis minima</i>	Rusbari	Solanaceae	H	D
55	<i>Pongamia pinnata</i>	Papri, Karanj	Fabaceae	T	D
56	<i>Prosopis cineraria</i>	Jand	Fabaceae	T	D
57	<i>Prosopis glandulosa</i>		Fabaceae	T	D
58	<i>Prosopis juliflora</i>	Vilayati Kikar	Fabaceae	T	D
59	<i>Ricinus communis</i>	Arand	Euphorbiaceae	S	D

S. No.	Botanical Name	Local Name	Family	Habit	Division
60	<i>Saccharum spontaneum</i>	Kandera	Poaceae	G	M
61	<i>Solanum nigrum</i>		Solanaceae	H	D
62	<i>Solanum xanthocarpum</i>	Kateli	Solanaceae	H	D
63	<i>Stellaria media</i>		Caryophyllaceae	H	D
64	<i>Syzygium cumini</i>	Jamun	Myrtaceae	T	D
65	<i>Tamarindus indica</i>	Imli	Fabaceae	T	D
66	<i>Terminalia arjuna</i>	Arjun	Combretaceae	T	D
67	<i>Tinospora cordifolia</i>	Giloi	Menispermaceae	C	D
68	<i>Tribulus terrestris</i>	Gokhru	Zygophyllaceae	H	D
69	<i>Tridax procumbens</i>	Sadahari	Asteraceae	H	D
70	<i>Vallisneria spiralis</i>	Dudhi	Apocynaceae	C	D
71	<i>Withania somnifera</i>	Ashwagandha	Solanaceae	H	D
72	<i>Xanthium strumarium</i>		Asteraceae	H	D
73	<i>Ziziphus</i> sp.		Rhamnaceae	S	D

Table: Diversity of Fauna (Mammals) in the Study Area

S. No.	Scientific Name	Local Name	Family	Schedule As Per (Wild Life Protection Act 1972)
1.	<i>Suncus murinus</i>	Grey Musk Shrew	Soricidae	Schedule V
2.	<i>Lepus negricollis</i>	Indian Hare	Leporidae	Schedule IV
3.	<i>Apodemus sylvaticus</i>	Common Field Mouse	Muridae	Schedule V
4.	<i>Bandicota bengalensis</i>	Indian Mole Rat	Muridae	Schedule V
5.	<i>Sus scrofa</i>	Wild boar	Suidae	Schedule III
6.	<i>Boselaphus tragocamelus</i>	Blue bull	Bovidae	Schedule III
7.	<i>Herpestes brachyurus</i>	Mongoose	Herpestidae	Schedule II
8.	<i>Bungarus caeruleus</i>	Common indian krait	Elapidae	Schedule IV
9.	<i>Rattus rattus</i>	House Rat	Muridae	Schedule V
10.	<i>Lepus negricollis</i>	Indian Hare	Leporidae	Schedule IV
11.	<i>Funambulus pennanti</i>	Palm Squirrel	Sciuridae	Schedule IV
12.	<i>Macaca mulatta</i>	Rhesus Macaque	Cercopithecidae	Schedule II
13.	<i>Semnopithecus</i> sp.	Hanuman langur	Cercopithecidae	Schedule II

Table: Diversity of Avi-fauna (Bird) in the Study Area

S. No.	Scientific Name	Local Name	Family	Schedule As Per (Wildlife Protection Act 1972)
1.	<i>Phalacrocorax niger</i>	Little Cormorant	Phalacrocoracidae	Schedule IV
2.	<i>Columba livia</i>	Rock Pigeon	Columbidae	Schedule IV
3.	<i>Acridotheres tristis</i>	common myna	Stumidae	Schedule III
4.	<i>Columba livia</i>	Pigeon	Columbidae	Schedule IV
5.	<i>Pavo cristatus</i>	Indian <i>peafowl</i>	Phasianidae	Schedule I
6.	<i>Halcyon smyrnensis</i>	White Throated Kingfisher	Alcedinidae	Schedule IV
7.	<i>Fulica atra</i>	Coot (M)	Rallidae	Schedule IV
8.	<i>Amaurornis phoenicurus</i>	White Breasted Waterhen	Rallidae	Schedule IV
9.	<i>Motacilla alba</i>	White wagtail	Motacillidae	Schedule IV
10.	<i>Mycteria leucocephala</i>	Painted storks	Ciconiidae	Schedule IV
11.	<i>Vanellus indicus</i> Schedule	Red Wattled Lapwing	Charadriidae	Schedule IV
12.	<i>Streptopelia tranquebarica</i>	Red Collared Dove	Columbidae	Schedule IV
13.	<i>Saxicoloides fulicata</i>	Indian Robin	Muscicapidae	Schedule IV
14.	<i>Corvus macrorhynchos</i>	Jungle Crow	Corvidae	Schedule IV
15.	<i>Corvus splendens</i>	House crow	Corvidae	Schedule V
16.	<i>Acridotheres ginginianus</i>	Bank Myna	Sturnidae	Schedule IV
17.	<i>Merops orientalis</i>	Small Bee-Eater	Meropidae	Schedule IV
18.	<i>Streptopelia senegalensi</i>	Little Brown Dove/ Laughing Dove	Columbidae	Schedule IV
19.	<i>Passer domesticus</i>	House sparrow	Passeridae	Schedule IV

Environment Formats for HORC ESHS Manual

1. Weekly Environmental Inspection Summary

1.0 Major issues of non-conformity in the past week are:

Issue	Reason
I. Air (Specify)	
II. Water (Specify)	
III. Noise (Specify)	
IV. Water (Specify)	
V. Storage (Specify)	
VI. Housekeeping (Specify)	
VII. Roads (Specify)	

2.0 Over the last week have been able to implement environmental management requirement as per contract

Yes No if not yes reasons are:

(i)

(ii)

(iii)

3.0 Following issues have not been resolved for more than past two weeks

- (i)
- (ii)
- (iii)

4.0 Support/Clarification from Employer’s Representative required in the following:

- (i)
- (ii)
- (iii)

5.0 Complaint received in the past week:

From	Action Taken	Reasons for Delay
(i) Public		
(ii) Client		
(iii) Statutory Agency		

Auditor:

Project Manager

Contact Number:

Contractor:

Environmental Manager	Project Manager	Document No.:

2. Weekly Environmental Inspection

Report No.:	Inspection Date:	Inspected by:
Inspection Area:		
Participants:		

S.No.	Item	Observation	Remarks	Action	
				By Date	By Whom
1.0	Air Pollution				
1.1	Dust (approach roads, adjacent road, working area, cement handling etc.)	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Site Dusty <input type="checkbox"/> Sprinkling carried out as required <input type="checkbox"/> Excavated soil removed within 2 days			
1.2	Generators	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Maintenance regime followed <input type="checkbox"/> Black smoke <input type="checkbox"/> Leaking oil <input type="checkbox"/> Drip pans not available			
1.3	Vehicles	<input type="checkbox"/> Satisfactory <input type="checkbox"/> PUC certificate available <input type="checkbox"/> Black smoke <input type="checkbox"/> Wheel washed/cleaned <input type="checkbox"/> Leaking oil <input type="checkbox"/> Side of vehicle clean of mud <input type="checkbox"/> Material transported in closed manner			
1.4	Air monitoring	<input type="checkbox"/> Carried out as per contract <input type="checkbox"/> Results reported as per contract <input type="checkbox"/> Remedial measures in place where required			
2.0	Water Pollution				
2.1	Site Drains	<input type="checkbox"/> Drainage system			

S.No.	Item	Observation	Remarks	Action	
				By Date	By Whom
		functional <input type="checkbox"/> No Contamination <input type="checkbox"/> Not blocked by debris/ garbage <input type="checkbox"/> No indications of Oil spilled in drains <input type="checkbox"/> Storage of chemical waste not nearby			
2.2	Adjacent Drains	<input type="checkbox"/> Not damaged <input type="checkbox"/> No signs of pouring bentonite <input type="checkbox"/> No signs of pouring Chemicals <input type="checkbox"/> Signs of discharging Silt/ debris			
2.3	Separator Tanks	<input type="checkbox"/> Tank not full of silt <input type="checkbox"/> Tank regularly emptied			
3.0	NOISE POLLUTION				
3.1	Noise control measures	<input type="checkbox"/> All powered mechanical equipment's are sound reduced <input type="checkbox"/> Acoustic / enclosures constructed in areas of excessive noise <input type="checkbox"/> Equipment located and directed away from noise receptors			
3.2	Generators provided with acoustic enclosures	<input type="checkbox"/> Effective <input type="checkbox"/> Not effective <input type="checkbox"/> Not provide			
3.3	Noise Monitoring	<input type="checkbox"/> Carried out as per contract <input type="checkbox"/> Not exceeded baseline values <input type="checkbox"/> Remedial measures in place <input type="checkbox"/> Results evaluated statistically for inclusion in Monthly report			
4.0	WASTE MANAGEMENT				
4.1	Waste Identified	<input type="checkbox"/> Chemical Flammable <input type="checkbox"/> Corrosive Construction			

S.No.	Item	Observation	Remarks	Action	
				By Date	By Whom
		related/ oil/ Filters/ Batteries <input type="checkbox"/> Hazardous <input type="checkbox"/> Other (Specify)			
4.2	Storage Containers & Bins	<input type="checkbox"/> Adequate number and properly place <input type="checkbox"/> Proper quality <input type="checkbox"/> Emptied regularly <input type="checkbox"/> Labelling proper <input type="checkbox"/> No spillage on container <input type="checkbox"/> surface noticed			
4.3	Storage Containers & Bins	<input type="checkbox"/> Pollutants (e.g. waste chemical), not dumped in bins <input type="checkbox"/> Recyclable (e.g. metal) not dumped in garbage bins			
4.4	Oil Waste	<input type="checkbox"/> Drip pans available <input type="checkbox"/> No oil stains on ground <input type="checkbox"/> Spill absorption material available <input type="checkbox"/> Waste oil poured in to designated waste drums <input type="checkbox"/> Used oil filters not dumped in garbage bins			
4.5	Excavated soil	<input type="checkbox"/> Storage satisfactory/ properly secured <input type="checkbox"/> Dumping in authorized areas <input type="checkbox"/> No interference with nearby drainage			
5.0	STORAGE				
5.1	Diesel Storage	<input type="checkbox"/> Extensive diesel spillage on ground not visible <input type="checkbox"/> Drip pans used when pumping diesel <input type="checkbox"/> Pipes / connectors/ pumps not leaking <input type="checkbox"/> Not located close to storm water drains <input type="checkbox"/> Transfer arrangement satisfactory			

S.No.	Item	Observation	Remarks	Action	
				By Date	By Whom
6.0	AESTHETICS & CLEANLINESS				
6.1	Housekeeping & Hygiene	<input type="checkbox"/> Designated storage area for materials <input type="checkbox"/> Scraps/brickbats/rubbish scattered at site <input type="checkbox"/> Proper space for handling waste <input type="checkbox"/> Area Clean and dry <input type="checkbox"/> Stagnant water treated weekly <input type="checkbox"/> Proper stacking of drums <input type="checkbox"/> Barricades are clean, in line, firmly secured and proper earthing <input type="checkbox"/> Water not allowed to accumulate in work area for any reason			
7.0	Roads				
7.1	Access Roads	<input type="checkbox"/> Satisfactory Maintenance <input type="checkbox"/> In urgent need of Maintenance			
7.2	Public Roads used by Contractor	<input type="checkbox"/> Satisfactory maintenance <input type="checkbox"/> Repair not carried out			

3. Air and Noise Monitoring Report Format

Air Monitoring Report

Parameter:

Unit :

CPCB Standard

Value:

Location	Monitoring Date	Measured Value	Base line value if any

Noise Monitoring Report

Day Time

Location	Category of Area/Zone	National Standard (Day time) Leq dB(A)	Baseline value (Day time), Leq dB(A)	Noise levels (Day time) Leq dB(A)

Night Time

Location	Category of Area/Zone	National Standard (Night time) Leq dB(A)	Baseline value (Night time), Leq dB(A)	Noise levels (Night time) Leq dB(A)

4. Monthly Waste Management Record

S.No	Waste Type	Unit	Quantity Generated		Quantity Disposed off		Adopted/Proposed disposal method
			For the month	Till date	For the month	Till date	
1	Construction and Demolition Waste						
	a. Concrete waste	MT					
	b. Demolition Waste	MT					
	c. Bentonite/Polym er mixed soil	CUM					
	d. Good earth	CUM					
2	Hazardous Waste						
	a. Waste oil	Litres					
	b. Oil filters	Nos					
	c. Air filters,	Nos					
	d. Cartridges etc.	Nos					
	e. Other (if any)						
3	Recyclable waste						
	Paper, plastic, wood, bottles, rubber etc.	Kg					
4	Bio-degradable waste						
	Food waste, vegetable waste etc	Kg					
5	Metal Scrap	Ton					
6	E -Waste	Nos/ Ton					
7	Miscellaneous (any other)						
Prepared by:		Reviewed by: (Environment Manager)				Approved by: (Project Manager)	

5. Water Consumption Details

S. No	Source of Water	Quantity Consumed for the month (KL)	Quantity Consumed till date (KL)
1	Ground Water Extracted		
2	Municipal Supply		
3	Water Tanker		
4	Water bottles		
Total (A)			
Breakup of Raw Water Consumption Detail			
S. No.	Particular	Quantity Consumed for the month (KL)	Quantity Consumed till date (KL)
1	Raw Water		
	a. Consumed in RO Plant		
	b. Sprinkling		
	c. Wheel washing		
	d. Domestic purpose like drinking, toilets, labour camps, office cleaning		
	e. Curing		
	f. Stone cutting		
	g. TM washing		
	h. Any other use		
	Total (B)		
2	R O treated water		
	Total (C)		
3	R O Reject Water		
	Total (D)		

Prepared by:

Reviewed by:
Environment Manager

Approved by:
Project Manager

6. Details on Fly Ash (If Applicable)

The Employer shall give his consent to the civil Contractor for using Fly Ash in concrete or brick works. The Contractor shall record all relevant details on the consumption of Fly Ash from the data of initial consumption to date of final use.

Fly Ash utilization in tonnes in Building Materials and Products for the FY-_____

Contract No. :

Name of Contractor :

Details regarding utilization of fly ash in road/flyover construction projects:

S. No.	Item of work	Total quantity of material used (tonnes)	Quantity of Fly ash used (tonnes)	Quantity of Soil/Earth any other material used (tonnes)	% fly ash used against total quantity of material used	Source of fly ash
Remarks:						

Prepared by:

**Reviewed by:
Environment Manager**

**Approved by:
Project Manager**

7. Material Consumption Details

S.No.	Particular	Unit	Quantity Consumed	
			For the month	Till date
1	Concrete	CUM		
2	Cement	MT		
3	Sand	MT		
4	Coarse Aggregate	MT		
5	Reinforcement	MT		
6	Admixtures	Litres		
7	Diesel	Litres		
8	Electricity	kWh		

Prepared by:	Checked by: (Environment Manager)
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