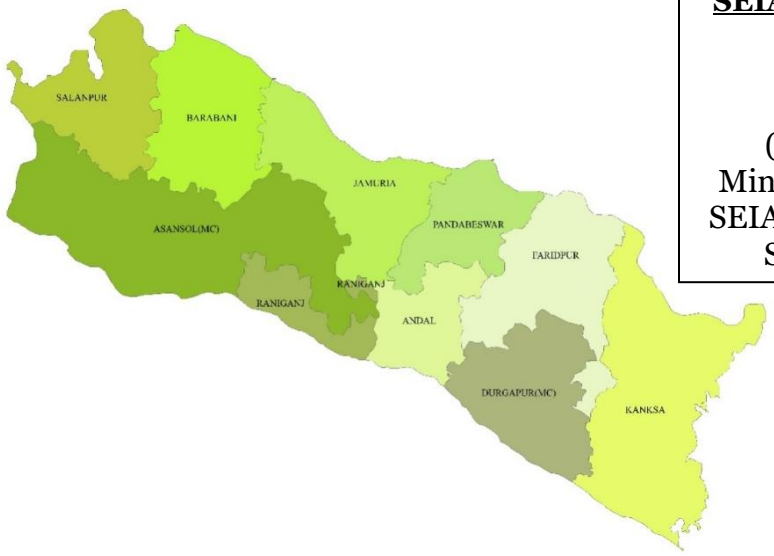
DISTRICT SURVEY REPORT
OF
PASCHIM BARDHAMAN DISTRICT

(Modified)
(For Mining of Minor Minerals)
As per Notification No. S.O.141 (E) New Delhi Dated 15th of January 2016, S.O.3611 (E) New DelhiDated 25th of July 2018 and Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change (MoEF&CC)

SEIAA APPROVAL DATE:

1st February 2024

(As published in the Minutes of 30th Meeting of SEIAA under Miscellaneous Section, Point No.4)



1st Modification: 29th November 2022

1st Approval: 22nd August 2022

PREPARED BY
Department of Industry, Commerce & Entreprises
Government of West Bengal

Version-2

Brief of Modification

Version No	DSR Status	Date	Remarks
Version-1	1st Approved DSR	22/08/22	DSR prepared as per guidelines.
Version-2	1st Modification	29/11/23	DSR modified to incorporate district boundary modification and inclusion of potential deposits of insitu mineral.

File No. DMM-12011(99)/10/2023-MINES SEC-DMM

GOVERNMENT OF WEST BENGAL
DIRECTORATE OF MINES & MINERALS
4, ABANINDRANATH TAGORE SARANI (CAMAC STREET), 2ND FLOOR,
KOLKATA – 700016
e-mail: dir.dmm-wb@nic.in

No. 440 MD/2C-708/23 Kolkata, the 24th November, 2023

To
The Chairman,
State Expert Appraisal Committee (SEAC),
West Bengal.

Sub: Approval of Modified District Survey Report of Paschim Bardhaman district reg.

Sir,

Enclosed please find the soft copy of the Modified District Survey Report (DSR) of Paschim Bardhaman district in West Bengal.

This is for your kind information and necessary action for approval as per norms.

Enclo: As stated above.

Yours faithfully,

24/11/23

DIRECTOR OF MINES & MINERALS
GOVERNMENT OF WEST BENGAL

No. 440(1)(2)MD/2C-708/23 Kolkata, the 24th November, 2023

Copy forwarded for information to:

1) The Member Secretary, SEIAA, West Bengal.
2) The Chairman & Managing Director, West Bengal Minerals Development & Trading Corporation Ltd.

24/11/23

DIRECTOR OF MINES & MINERALS
GOVERNMENT OF WEST BENGAL

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29/11/2023
O/C

GOVERNMENT OF WEST BENGAL
DIRECTORATE OF MINES & MINERALS
4, ABANINDRANATH TAGORE SARANI (CAMAC STREET), 2ND FLOOR,
KOLKATA – 700016
e-mail: dir.dmm-wb@nic.in

No. 441 MD/2C-708/23

Kolkata, the 24 th November, 2023

TO WHOM IT MAY CONCERN

This is to certify that theModified District Survey Report of Paschim Bardhaman District in West Bengal has been prepared in accordance with the prevailing norms and guidelines applicable for the purpose. This Modified District Survey Report has been duly consulted through the District Authority concerned and the comments and observations as received from the District Authority has been duly incorporated in the report. Authorized officials of the Directorate of Mines & Minerals under the Deptt. of Industry, Commerce and Enterprises, Govt. of West Bengal has scrutinised the Modified District Survey Report of Paschim Bardhaman District and found the same to be in order.

Now, this Modified District Survey Report of Paschim Bardhaman district is forwarded to the State Level Environment Impact Assessment Authority (SEIAA), West Bengal for necessary approval.

24/11/23

DIRECTOR OF MINES & MINERALS
GOVERNMENT OF WEST BENGAL

29/11/2023

অতিরিক্ত জেলা শাসক এবং জেলা ভুমি
ও
ভুমি সংস্কার আধিকারকের করণ
পশ্চিম বর্ধমান
বিবেকানন্দ সরণি, রামকৃষ্ণ মিশণ, কন্যাপুর
আসানসোল, পিন – ৭১৩৩০৫
ইমেল – dlropaschimbardhaman@gmail.com

Office of the Additional District Magistrate
And
District Land & Land Reforms Officer
Paschim Bardhaman
Vivekananda Sarani, Ramkrishna Mission, Kanyapur
Asansol, PIN - 713305
Email – dlropaschimbardhaman@gmail.com

Memo No. 4675 /MM /DL&LRO/PAB/23 Date : 12/10/23

To
The Chairman and Managing Director,
West Bengal Mineral Development & Trading Corporation Ltd.
DJ-10, 3rd Floor, Sector II,
Saltlake, Kolkata 700 091

Sub. : Paschim Bardhaman District Survey Report to be updated according to the objection received

Sir,

This to bring to your kind information that, the modified District Survey Report of Paschim Bardhaman district has been received by e-mail from Director Mines and Minerals, Kolkata on 14.08.2023, the same was published in the Paschim Bardhaman District website on 18.08.2023 and objection was invited within 30 days. Nine (9) objection has been received (copy enclosed) within due date. Details are given below

Sl. No.	Auction ID	Proponent name	Mouza	Block	Area (inAcre)	Remarks
1	2019_WB_1326	Koilash Mahato	Desher Mohan	Jamuria	9.44	In existing zone of DSR
2	2018_WB_1125	Debnath Enterprise	Desher Mohan	Jamuria	8.90	-DO-
3	2019_WB_1324	M/S Libra Retaier Pvt Ltd	Rasunpur	Barabani	4.44	-DO-
4	2018_WB_1122	Laltu Dutta	Darbardanga	Jamuria	6.82	-DO-
5	2018_WB_1126	Ganesh Nandi	Desher Mohan	Jamuria	9.33	-DO-
6	2019_WB_1325	M/S Reliance Stone Product	Darbardabga	Jamuria	6.86	-DO-
7	2017_DMBUW_741	Anil Kr. Singh	Fatepur	Salanpur	6.00	-DO-
8	2017_DMBUW_740	Rupuchak Enterprises	Fatepur	Salanpur	6.20	-DO-
9	2017_DMBUW_729	India Digital Entertainment Pvt Ltd	Chinchurbil	Jamuria	7.66	-DO-

In the modified DSR the above nine (9) sand blocks have been entered in the existing zones. Hence you are requested to take necessary measures for including the sand blocks in potential zones of DSR Paschim Bardhaman.

Enclo. : As stated

Yours faithfully,

12/10/23

Additional District Magistrate and
District Land & Land Reforms Officer,
Paschim Bardhaman

ADDITIONAL DISTRICT MAGISTRATE
&
DISTRICT LAND & LAND REFORMS OFFICER
PASCHIM BARDHAMAN

Memo No. 4675 /1(2)/MM/DL&LRO/PAB/23 Date : 12/10/23

Copy forwarded to the District Magistrate, Paschim Bardhaman for favour of his kind information.

12/10/23

Additional District Magistrate and
District Land & Land Reforms Officer,
Paschim Bardhaman

ADDITIONAL DISTRICT MAGISTRATE
&
DISTRICT LAND & LAND REFORMS OFFICER
PASCHIM BARDHAMAN

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Abbreviations

% DEP – Departures

° C – Degree Centigrade

BGL – Below Ground Level

CD - Community Development

Cft- Cubic Feet

CGWB - Central Ground water Board

CRIS - Customized Rainfall Information System

Cum - Cubic meter

DGMS - Directorate General of Mines Safety

DGPS - Differential Global Positioning system.

DL&LRO - District Land & Land Reform officer

DSR - District Survey Report

EC – Environmental Clearance

EIA- Environment Impact Assessment

EMGSM - Enforcement and Monitoring Guideline for Sand Mining

ENVIS - Environmental Information System

ft – Feet

GIS - Geographical Information System

GMEC - Global Management and Engineering Consultant

GSI - Geological Survey of India

Ha – Hectare

hr - Hour

IMD – Indian Meteorological Department

ISRO - The Indian Space Research Organization

KM - Kilometer

LISS - Linear Imaging Self-Scanning Sensor

LOI - Letter of Intent

LULC - Land Use Land Cover

m^2 - Square meter

MBT - Main Boundary Thrust

MCT - Main Central Thrust

MFT - Main Frontal Thrust

Mcum – Million Cubic Meters

MMDR - Mines & Minerals (Development and Regulation) Act

MMR - Metalliferous Mines Regulation

MOEF & CC - Ministry of Environment, forest & Climate Change

Mph- miles per hour

M-Sand - Mineral Sand

MSME - Micro, Small & Medium Enterprises

Mt - Metric Ton

MT – Million Tons

NGT - National Green Tribunal

NH – National Highway

NIC - National Informatics Centre

OC - Officer In Charge

OGL - Original Ground level

PSU - Public Sector Unit

R/F – Rain Fall

SSMG - Sustainable Sand Mining Guidelines

WBMDTCL- West Bengal Mineral Development and Trading Corporation Limited

The WBMMCR, 2016 – The West Bengal Minor Mineral Concession Rules, 2016

The West Bengal Sand Mining Policy, 2021

EMGSM-2020- Enforcement & Monitoring Guidelines for Sand Mining

PR- Pre Monsoon

PO- Post Monsoon

PSBD PASCHIM BARDHAMAN

AS ASANSOL (MC)

SL SALANPUR

BR BARABANI

JM JAMURIA

RG RANIGANJ

PB PANDABESWAR

KN KANSA

FP FARIDPUR

AN ANDAL

DG DURGAPUR (MC)

AJ AJAY

BLDS: BUILDING STONE

BS: BLACK STONE

CC: CHINA CLAY

GL: GRAVEL MINE

GR: GRANITE

LR: LATERITE

QT: QUARTZ VEIN

GSI- Geological Survey of India

DMM- Directorate of Mines and Minerals

Key Definitions

Riverbed: A riverbed is the area between two banks of river where sediment deposited. During the normal flow period, river water is contained in and flows along the riverbed. However, during a flood, the river overflows the riverbed and flows onto the floodplain.

Sandbars: The sandbar is the ridge of sand or coarse sediment that is built over a period of time.

Pre monsoon Sandbars: Sandbars which are identified from satellite imagery of pre monsoon period.

Post monsoon Sandbars: Sandbars which are identified from satellite imagery of post monsoon period.

Restricted Area: Sandbars or part of sandbars which are falling within restricted area. As per the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) 2020 the restricted zone for mining is a distance from the bank is ¼th of river width and not be less than 7.5 meters. Also, there is a no mining zone up to a distance of 1 kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side. No mining zone has been marked for an area up to a width of 100 meters from the active edge of embankments.

Potential Zone: Sandbars which are falling within the central $3/4^{th}$ part of the riverbed and which are not falling within the restricted area.

Potential Block: Each individual sand bars of potential zone is Potential Block.

River bed occurrence: River bed occurrence means sand, stone, boulder, pebbles, gravel accumulated in the river bed by natural phenomenon.

Replenishment: Quantum of sand deposited in a mined out void during monsoon period.

Aggradations: Aggradation (or alluviation) is the term used in geology for the increase in land elevation, typically in a river system, due to the deposition of sediment. Aggradation occurs in areas in which the supply of sediment is greater than the amount of material that the system is able to transport.

Act: It means the Mines and Minerals (Development and Regulation) Act, 1957(67 of 1957), as subsequently amended.

Mineral: It means minor minerals as defined in clause (e) of section 3 of the Act.

Sand: A natural resource, is a minor mineral as defined under S 3(e) of the Mines and Minerals (Development and Regulation) Act, 1957 (" MMDR Act").

Lease: It means a mining lease granted under West Bengal Minor Mineral Concession Rules, 2016.

Mining: Excavation of mineral by manual method or using machineries.

EXECUTIVE SUMMARY

Paschim Bardhaman district is a predominantly urban mining-industrial district in West Bengal. The headquarter of the district is Asansol. It was formed on 7 April 2017 after bifurcation of the erstwhile Bardhaman district as the 23rd district of West Bengal. The total geographical area of the district is 1603.17 sq. km.

The Paschim Bardhaman district comprises two subdivisions - Asansol Sadar and Durgapur. Asansol is the districts headquarter. There are two municipal corporations, eight community development blocks, 65 census towns and 62 Gram Panchayats in the district.

Paschim Bardhaman district has a tropical climate. The coldest month is January, while the hottest month is May. The monsoon is from June to September with an annual average rainfall of 1,044 mm. In monsoon period from June to September, wind blows from the south-west direction recognized as south-west monsoon.

Paschim Bardhaman district is well known for its coal resources which belong to Raniganj and Barakar Formation of Gondwana super-group. The district in its western part is a continuation of Chhotanagpur gneissic complex where as eastern part merged with the overlying Rajmahal trap. South-eastern part of the district merged with the margin Bengal Basin. The Gondwana seems to be occasionally traverse with the younger dykes which are potential sites development of stone aggregates. The margin between Chhotanagpur and Gondwana are often found to be clay bearing and are also linked with the potential economic mineral resources. Occurrences of lignite resources are also reported in the district as a part of younger Bengal Basin. A fairly good amount mono-mineralic gravel deposits is found to be spread over the Gondwana and is reported north-west of Durgapur city. A good stretch of morrum is found to be overlain the Gondwanas as well as the recent deposits of Bengal Basin. Atleast in few occurrences' quartzite deposits are also reported to be economically extracted.

Damodar and Ajay are the major two rivers defining the drainage of the district. Damodar River defines most of the southern boundary of the district while Ajay River defines the northern boundary shares with Birbhum district. However, only Ajay River found to be main resource of sand from Paschim Bardhaman district which is the source of construction sand fed the requirements of the state.

Potential minor mineral blocks of Sand and other in-situ minerals have been identified and listed in this District Survey Report. Restriction zones are defined as per the Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) guidelines 2020.

The District Survey Report (DSR) has been modified to incorporate district boundary revision based on Survey of India database. Modified DSR also includes potential zones with respect to insitu minor mineral deposits of the district.

1 Preface

The need for District Survey Report (DSR) have been necessitated by Ministry of Environment, Forest and Climate Change (MoEF & CC) vide there Notification No. 125 (Extraordinary, Part II Section 3, Sub-section ii), S.O. 141 (E), dated 15th January 2016. The notification was addressed to bring certain amendments with respect to the EIA notification 2006 and in order to have a better control over the legislation. District level committee's have been introduced in the system. As a part of this notification, preparation of District Survey Reports has been introduced. Subsequently, MoEF & CC has published Notification No. 3611 (E), dt. 25th July, 2018 regarding inclusion of the "Minerals Other than Sand" and format for preparation of the DSR has been specified. Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by MoEF & CC is prepared in consideration of various orders/directions issued by Hon'ble NGT in matters pertaining to illegal sand mining and also based on the reports submitted by expert committees and investigation teams. This DSR has been prepared in conformity with the S O 141 (E), S O 3611 (E) and other sand mining guidelines published by MoEF & CC time to time as well as the requirement specified in WBMMCR, 2016.

The purpose of DSR is to identify the mineral potential areas where mining can be allowed; and also, to distinguish areas where mining will not be allowed due to proximity to infrastructural structures and installations, areas of erosion, areas of environmental sensitivities etc. The DSR would also help to estimate the annual rate of replenishment wherever applicable.

Preparation of this DSR involved both primary and secondary data generation. The primary data generation involved the site inspection, survey, ground truthing etc. while secondary data has been acquired through various authenticated sources and satellite imagery studies. The secondary data related to district profile, local geology, mineralization and other activities are available in rather a piecemeal fashion. The DSR of Paschim Bardhaman district describes the general geographical profile of the district, distribution of natural resources, livelihood, climatic condition, inventory of minor minerals and revenue generation.

Modification of the District Survey Report (DSR) is required because of the following:

- To include insitu minor mineral potential zones of the district into the DSR.
- To incorporate district boundary revision based on Survey of India database instead of district portal information.
- To include the potential sandbars based on 2022 Satellite Imagery study for quantification of potential sandbars.

The modified DSR Report has been presented in 3 parts. The 1st part contains the general information of the district. The 2nd part highlights the riverbed deposits that is sand and gravels. The 3rd part of the modified report contains the occurrences of institu minor mineral deposits of the district. The modifications of the DSR of Paschim Bardhaman have been furnished in Annexure 7.

2 Introduction

The District Survey Report of Paschim Bardhaman District has been prepared as per the guide line of Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India vide Notification S.O.-1533(E) dated 14th Sept, 2006 and subsequent MoEF&CC Notification S.O. 141(E) dated 15th Jan, 2016. This report shall guide systematic and scientific utilization of natural resources, so that present and future generation may be benefitted at large. Further, MoEF&CC published a notification S.O. 3611(E) Dated 25th July, 2018 and recommended the format for District Survey Report.

The main objective of DSR is identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area. The DSR would also help to calculate the annual rate of replenishment wherever applicable and allow time for replenishment. Besides the sand mining, the DSR also include the potential development scope of in-situ minor minerals.

The objectives of the District Survey Report are as follows:

1. To identify and quantify minor mineral resources for its optimal utilization.
2. To regulate sand and gravel mining, identification of site-specific end-use consumers and reduction in demand and supply gaps.
3. To facilitate use information technology (IT) for surveillance of the sand mining at each step.
4. To enable environmental clearance for cluster of sand and gravel mines.
5. To restrict illegal mining.
6. To reduce occurrences of flood in the area.
7. To maintain the aquatic habitats.
8. To protect ground water in the area by limiting extraction of material in riverbeds to an elevation above the base flow.
9. To maintain data records viz. details of mineral resource, potential area, lease, approved mining plan, co-ordinates of lease hold areas, and revenue generation.
10. To design a scientific mining plan and estimate ultimate pit limit.
11. To frame a comprehensive guideline for mining of sand and other minor minerals.

The District Survey Report (DSR) comprises secondary data on geology, mineral resources, climate, topography, land form, forest, rivers, soil, agriculture, road, transportation, irrigation etc of the district collected from various published and un-published literatures and reports as well as various websites. Data on lease and mining activities in the district, revenue etc. have been collected from the DL & LRO office of the district and from West Bengal Mineral Development Corporation Limited.

2.1 Statutory Framework

2.1.1 Evolution of the Environmental Regulatory Framework:

Ministry of Environment, Forest and Climate Change (MoE &CC) has published several notifications time to time to formulate and implement the District Survey Report (DSR) for every district. Statutory Framework and its legal aspect with respect to DSR are tabulated in Table 2.1.

Table 2.1: Requirement of District Survey Report and its year wise modification of Guidelines

Year	Particulars
1994	The Ministry of Environment, Forest and Climate Change (MoEF & CC) published Environmental Impact Assessment Notification 1994 which is only applicable for the Major Minerals more than 5 ha.
2006	In order to cover the minor minerals also into the preview of EIA, the MoEF&CC has issued EIA Notification SO 1533 (E), dated 14th September 2006, made mandatory to obtain environmental clearance for both Major and Minor Mineral more than 5 Ha.
2012	Further, Hon'ble Supreme Court wide order dated the 27th February, 2012 in I.A. No.12- 13 of 2011 in Special Leave Petition (C) No. 19628-19629 of 2009, in the matter of Deepak Kumar etc. Vs. State of Haryana and Others etc., ordered that "leases of minor minerals including their renewal for an area of less than five hectares be granted by the States/Union Territories only after getting environmental clearance from MoEF"; and Hon'ble National Green Tribunal, order dated the 13th January, 2015 in the matter regarding sand mining has directed for making a policy on environmental clearance for mining leases in cluster for minor Minerals.
2016	The MoEF&CC in compliance of above Hon'ble Supreme Court's and NGT'S order has prepared "Sustainable Sand Mining Guidelines (SSMG), 2016" in consultation with State governments, detailing the provisions on environmental clearance (EC) for cluster, creation of District Environment Impact Assessment Authority, preparation of District survey report and proper monitoring of minor mineral. There by issued Notification dated 15.01.2016 for making certain amendments in the EIA Notification, 2006, and made mandatory to obtain EC for all minor minerals. Provisions have been made for the preparation of District survey report (DSR) for River bed mining and other minor minerals.
2016	The West Bengal Minor Minerals Concession Rules, 2016 amended the Mines and Minerals (Development and Regulation) Act, 1957 (Act 67 of 1957), to make the rules regulating the grant of mining licenses, prospecting license-cum-mining leases and mining leases in respect of minor minerals by auction process. The rule also incorporates EIA 2016 also includes SSMG 2016 for minor mineral mining.

Year	Particulars
2018	MoEF&CC published a notification S.O. 3611(E) Dated 25th July, 2018 and recommended the format for District Survey Report .The notification stated about the objective of DSR i.e "Identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area".
2020	Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) 2020 has been published modifying Sustainable sand Mining Guidelines, 2016 by MoEF&CC for effective enforcement of regulatory provisions and their monitoring. The EMGSM 2020 directed the states to carry out river audits, put detailed survey reports of all mining areas online and in the public domain, conduct replenishment studies of river beds, constantly monitor mining with drones, aerial surveys, ground surveys and set up dedicated task forces at district levels. The guidelines also push for online sales and purchase of sand and other riverbed materials to make the process transparent. They propose night surveillance of mining activity through night-vision drones.
2021	The West Bengal Sand Mining Policy, 2021- The State Government through this policy intends to govern the excavation, transportation, storage, sale and consumption of sand. The State Government intends to appoint the West Bengal Mineral Development and Trading Corporation Ltd. ("WBMDTCL") as the designated agency, in order to effectively address the issues of indiscriminate mining of sand, black-marketing, artificial supply shortage through hoarding and to ensure compliance with environmental regulations and affordable pricing for the end consumers.
2022	The Policy of Mining of Minor Minerals in Private/Raiyati land-The state government in November 2022 introduced a new 'Raiyati' policy 2022 for the mining of minor minerals on private land. The interested Raiyat/Group of Raiyats/Company as Raiyat shall apply for grant of Letter of Intent (LoI) to the state nodal agency (WBMDTCL) for an area of minimum 1 Ha on their own land(s) along with land details for all minor minerals except morrum.

2.1.2 Other Guidelines for Sand Mining in India:

The West Bengal Minor Minerals Concession Rules (WBMMCR), 2016

1) (a) No person shall undertake mining operation in any area prohibited by the 'Stale Government in the public interest by notification in the *Official Gazette*.
Provided that nothing in the sub-rule shall affect any mining operation undertaken in any area in accordance with the terms and conditions of a mining lease or mineral concession already granted.
(b) No person shall transport or store or cause to be transported or stored any mineral otherwise than in accordance with the provisions of these rules and the West Bengal Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2002.

(2) No minor mineral coming out in course of digging of wells or excavation of tanks shall be disposed of by the person digging or excavating without informing the District Authority as well as the Executive Officer of the *Panchayat Samiti* or the Executive Officer of the Municipality concerned, as the case may be, about such occurrence.
Provided that disposal of such minor mineral may be allowed on pre-payment of prices of such minor mineral at the prevailing market rate as determined on the basis of the rates published by the Public Works Department / concerned department of the State Government for the concerned area from time to time.

(3) No mining of river bed occurrences shall be allowed within 300 meters, upstream and downstream, measured from the centre line of any bridge, regulator or similar hydraulic structure and from the end point of bank protection works.

(4) No river bed mining shall be allowed beneath 3 meters of the river bed or ground water level, whichever is less.

(5) No mining operation in case of river bed occurrence shall be done within a distance of three (3) kilometers of a barrage axis or dam on a river unless otherwise permitted by the concerned Executive Engineer or Revenue Officer or authorized officer and such distance shall be reckoned across an imaginary line parallel to the 'barrage, or dam axis, as the case maybe.

(6) No extraction of river bed occurrence shall 'be allowed beyond the central one third of the river bed, or keeping a distance of 100 meter from the existing bank line whichever is less, unless otherwise permitted by the concerned Executive Engineer or Revenue Officer.

(7) No extraction of minerals other than river bed occurrence shall be allowed within fifty (50) meters from any road, public structure, embankment, railway line, bridge canal, road and other public works or buildings.

(8) No mining lease shall be granted without proof of existence of mineral contents in the area for which the application for a mining lease has been made in accordance with such parameters as may be prescribed by the Government from time to time.

N.B- The aforesaid application for mining lease shall succeed the competitive bidding for mining lease for a specified mineral(s).

Sustainable Sand Mining Management Guidelines (SSMMG), 2016 by MoEF&CC.

The sustainable sand Mining Management Guidelines 2016 has been prepared after extensive consultation with the States and Stakeholders over a period of one year. The main objective of

the Guideline is to ensure sustainable sand mining and environment friendly management practices in order to restore and maintain the ecology of river and other sand sources.

a) Parts of the river reach that experience deposition or aggradation shall be identified first. The Lease holder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.

b) The distance between sites for sand and gravel mining shall depend on the replenishment rate of the river. Sediment rating curve for the potential sites shall be developed and checked against the extracted volumes of sand and gravel.

c) Sand and gravel may be extracted across the entire active channel during the dry season.

d) Abandoned stream channels on terrace and inactive flood plains be preferred rather than active channels and their deltas and flood plains. Stream should not be diverted to form inactive channel.

e) Layers of sand and gravel which could be removed from the river bed shall depend on the width of the river and replenishment rate of the river.

f) Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.

g) Segments of braided river system should be used preferably falling within the lateral migration area of the river regime that enhances the feasibility of sediment replenishment.

h) Sand and gravel shall not be extracted within 200 to 500 meter from any crucial hydraulic structure such as pumping station, water intakes, and bridges. The exact distance should be ascertained by the local authorities based on local situation. The cross-section survey should cover a minimum distance of 1.0 km upstream and 1.0 km downstream of the potential reach for extraction. The sediment sampling should include the bed material and bed material load before, during and after extraction period. Develop a sediment rating curve at the upstream end of the potential reach using the surveyed cross- section. Using the historical or gauged flow rating curve, determine the suitable period of high flow that can replenish the extracted volume. Calculate the extraction volume based on the sediment rating curve and high flow period after determining the allowable mining depth.

h) Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.

Flood discharge capacity of the river could be maintained in areas where there are significant flood hazard to existing structures or infrastructure. Sand and gravel mining may be allowed to maintain the natural flow capacity based on surveyed cross- section history.

i) Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.

j) The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, this sandy-gravelly track constitutes excellent conduits and holds the greater potential for ground water recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches.

k) Mining depth should be restricted to 3 meter and distance from the bank should be 3 meter or 10 percent of the river width whichever less.

The borrow area should preferably be located on the river side of the proposed embankment, because they get silted up in course of time. For low embankment less than 6 m in height,

borrow area should not be selected within 25 m from the toe/heel of the embankment. In case of higher embankment the distance should not be less than 50 m. In order to obviate development of flow parallel to embankment, cross bars of width eight times the depth of borrow pits spaced 50 to 60 meters centre-to-centre should be left in the borrow pits.

l) Demarcation of mining area with pillars and geo-referencing should be done prior to start of mining.

Enforcement and Monitoring Guidelines for sand Mining, 2020 (MoEF&CC)

The Ministry of Environment Forest and Climate Change formulated the Sustainable Sand Management Guidelines 2016 which focuses on the Management of Sand Mining in the Country. But in the recent past, it has been observed that apart from management and systematic mining practices there is an urgent need to have a guideline for effective enforcement of regulatory provision and their monitoring. Section 23 C of MMDR, Act 1957 empowered the State Government to make rules for preventing illegal mining, transportation and storage of minerals. But in the recent past, it has been observed that there was large number of illegal mining cases in the Country and in some cases, many of the officers lost their lives while executing their duties for curbing illegal mining incidence. The illegal and uncontrolled illegal mining leads to loss of revenue to the State and degradation of the environment.

a) Parts of the river reach that experience deposition or aggradation shall be identified. The Leaseholder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.

b) The distance between sites for sand and gravel mining shall depend on the replenishment rate of the river. Sediment rating curve for the potential sites shall be developed and checked against the extracted volumes of sand and gravel.

c) Sand and gravel may be extracted across the entire active channel during the dry season.

d) Abandoned stream channels on the terrace and inactive floodplains be preferred rather than active channels and their deltas and flood plains. The stream should not be diverted to form the inactive channel.

e) Layers of sand and gravel which could be removed from the river bed shall depend on the width of the river and replenishment rate of the river.

f) Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.

g) Segments of the braided river system should be used preferably falling within the lateral migration area of the river regime that enhances the feasibility of sediment replenishment.

h) Sand and gravel shall not be extracted up to a distance of 1 kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side.

i) The sediment sampling should include the bed material and bed material load before, during and after the extraction period. Develop a sediment rating curve at the upstream end of the

potential reach using the surveyed cross-section. Using the historical or gauged flow rating curve, determine the suitable period of high flow that can replenish the extracted volume. Calculate the extraction volume based on the sediment rating curve and high flow period after determining the allowable mining depth.

j) Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two-thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.

k) The flood discharge capacity of the river could be maintained in areas where there is a significant flood hazard to existing structures or infrastructure. Sand and gravel mining may be allowed to maintain the natural flow capacity based on surveyed cross-section history. Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.

l) The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, this sandy-gravelly track constitutes excellent conduits and holds the greater potential for groundwater recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches.

m) Mining depth should be restricted to 3 meters and distance from the bank should be ¼th or river width and should not be less than 7.5 meters.

n) The borrow area should preferably be located on the riverside of the proposed embankment because they get silted in the course of time. For low embankment, less than 6 m in height, borrow area should not be selected within 25 m from the toe/heel of the embankment. In the case of the higher embankment, the distance should not be less than 50 m. In order to obviate the development of flow parallels to the embankment, crossbars of width eight times the depth of borrow pits spaced 50 to 60 meter center-to-center should be left in the borrow pits.

o) Demarcation of mining area with pillars and geo-referencing should be done prior to the start of mining.

p) A buffer distance /un-mined block of 50 meters after every block of 1000 meters over which mining is undertaken or at such distance as may be the directed/prescribed by the regulatory authority shall be maintained.

q) A buffer distance /unmined block of 50 meters after every block of 1000 meters over which mining is undertaken or at such distance as may be the directed/prescribed by the regulatory authority shall be maintained.

r) River bed sand mining shall be restricted within the central 3/4th width of the river/rivulet or 7.5 meters (inward) from river banks but up to 10% of the width of the river, as the case may be and decided by regulatory authority while granting environmental clearance in consultation with irrigation department. Regulating authority while regulating the zone of river bed mining shall ensure that the objective to minimize the effects of riverbank erosion and consequential channel migration are achieved to the extent possible. In general, the area for removal of minerals shall not exceed 60% of the mine lease area, and any deviation or relaxation in this regard shall be adequately supported by the scientific report.

s) Mining Plan for the mining leases(non-government) on agricultural fields/Patta land shall only be approved if there is a possibility of replenishment of the mineral or when there is no riverbed mining possibility within 5 KM of the Patta land/Khatedari land. For government

projects mining could be allowed on Patta land/Khatedari land but the mining should only be done by the Government agency and material should not be used for sale in the open market.

The minerals reserve for riverbed area is calculated on the basis of maximum depth of 3 meters and margins, width and other dimensions as mentioned in para (s) above. The area multiplied by depth gives the volume and volume multiplied with bulk density gives the quantity in Metric Ton. In case of riverbed, mineable material per hectare area available for actual mining shall not exceed the maximum quantity of 60,000 MT per annum.

2.2 Methodology of DSR Preparation

The steps followed during the preparation of District Survey Report are given in Figure 2.1. The individual steps are discussed in following paragraphs.

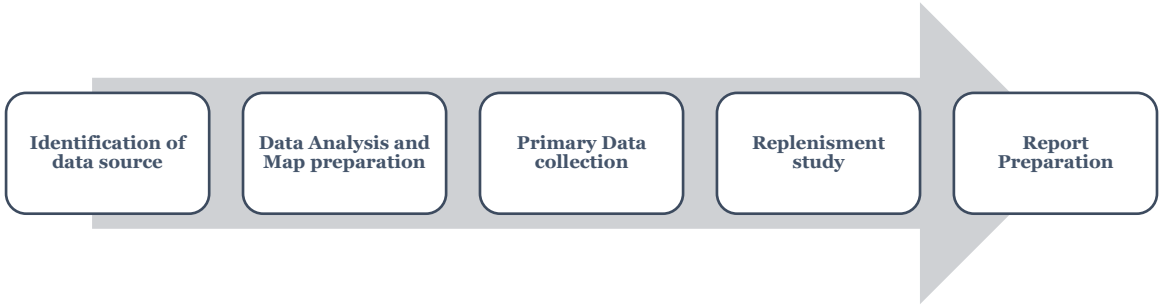


Figure 2.1: Steps followed in preparation of DSR

Data source Identification: District Survey Report has been prepared based on the Primary data base and secondary data base collected and collated from different sources. This is very critical to identify authentic data sources before compiling the data set. The secondary data sources which are used in this DSR are mostly taken from public domain and or from the published report in reputed journal. Information related to district profile has been taken from District Census report, 2011 and District Statistical Handbook published by the Govt. of West Bengal. Potential mineral resources of the district have been described based on the published report of Geological Survey of India (GSI) or any other govt. agencies like MECL etc. List of Mining lease, name of lease holder, lease/Block area, resource in already allotted mining lease, revenue from minor mineral sector etc. have been collected from the concern DL&LRO offices of the district. Satellite images have been used for map preparation related to physiography and land use/land cover of the district.

Data Analysis and Map preparation: Dataset which are captured during the report preparation, are gone through detail analysis work. District Survey Report involves the analytical implication of the captured dataset to prepare relevant maps.

Methodology adopted for preparation of relevant maps is explained below.

Land Use and Land Cover Map: Land Use and Land Cover classification is a complex process and requires consideration of many factors. The major steps of image classification may include determination of a suitable classification system via Visual Image Interpretation, selection of training samples, Satellite image (FCC-False Colour Composite) pre-processing, selection of suitable classification approaches, post-classification processing, and accuracy assessment.

Here LISS-III satellite Imagery has been taken for Supervised Classification as supervised classification can be much more accurate than unsupervised classification, but depends heavily on the training sites, the skill of the individual processing the image, and the spectral distinctness of the classes in broader scale.

According to the Visual Image Interpretation (Tone, Texture, Colour etc.) training set of the pixel has been taken. Pictorial descriptions of Land Use classification are explained in Figure 2.2.

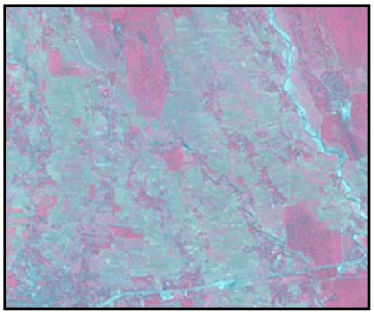
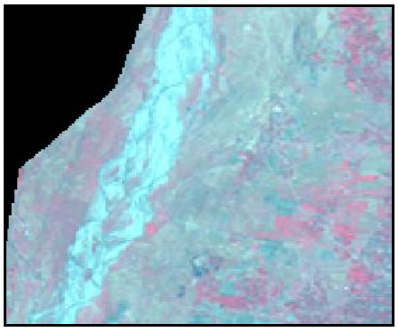
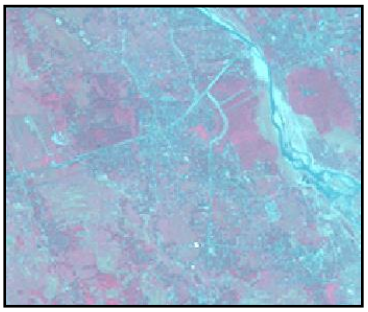
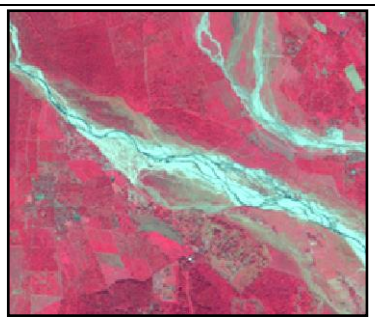
	
Agricultural Land - Based on their Geometrical shape, Red and Pink colour tone, Agricultural Land has been identified.	**Vegetation Covered Area** - Based on their continuous Red colour tone, Vegetation Covered Area has been identified.
	
Agricultural Fallow Land - Based on their Geometrical shape, Light and dark cyan with light pink colour tone, Agricultural Land has been identified.	**Bad Land Topography**- Light Yellowish mixed with cyan colour has been identified as Bad Land Topography.
	
Settlement – Area with Cyan Colour including geometrical shape has been recognised as Settlement Area.	**Water Bodies –** Dark blue colour has been classified as Water Bodies.

Figure 2.2: Pictorial description of Land Use Classification methods

Geomorphological Map: The major steps of preparing Geomorphological Map is identifying features like – Alluvial Fan, Alluvial Plain, Hilly Region etc. from Satellite Imagery

(FCC-False Colour Composite) via Visual Image Interpretation and then digitisation has been taken into the consideration to prepare map including all the Geomorphological features according to their location. Pictorial descriptions of Geomorphological unit's classification are explained in Figure 2.3.

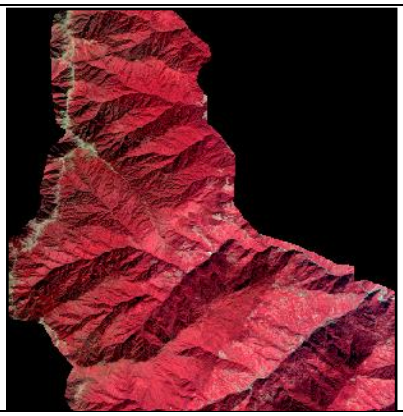
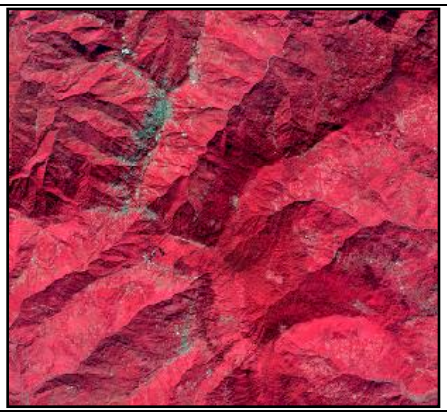
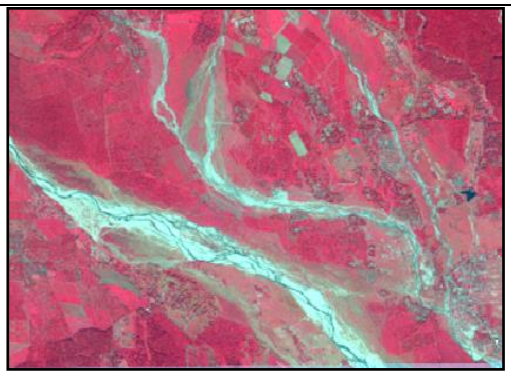
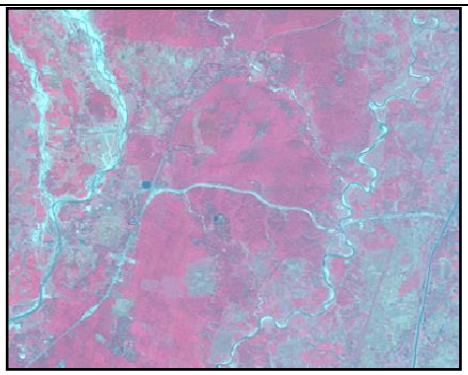
	
Upper Hills – Upper hilly region has been identified based on their high elevation and sharp edges of the land.	**Lower Hills** – Lower hilly has been identified based on their elevation and sharp edges which is comparatively less in height than upper hilly region.
	
Alluvial Fan- A fan-based deposition formed by stream where the velocity is abruptly decreased. In Satellite Imagery the flat area has been identified as Alluvial Fan just below the Lower hilly region.	**Alluvial Plain**- Alluvial plain is a largely flat landform created by the deposition of sediment over a long period. In satellite Imagery the flat land just below the Alluvial Fan has been identified as Alluvial Plain.

Figure 2.3: Pictorial description of Geomorphological Units Classification methods

Physiographical Map: The major step of preparing Physiographical Map is generating contour at a specific interval to show the elevation of the area using Cartosat DEM.

Block Map/Transportation Map/Drainage Map:

- Raw Data collected from **National Informatics Centre (NIC Website) during Sept 2020.**
- Data has been geo-referenced using GIS software.

- Digitization of block boundary, district boundary, state boundary, international boundary, and district headquarter, sub –district headquarter, places, road, railway, river, nala etc.
- Road name, River name, Railway name has been filled in attribute table of the Layers
- Final layout has been prepared by giving scale, legend, north arrow, etc.

Earthquake Map:

- Raw data collected from **Ministry of Earth Science.**
- Data has been geo-referenced using GIS software.
- Digitization of Earthquake zone and superimposed it over Block Boundary.
- Zone name has been filled in attribute table of the Layers
- Final layout has been prepared by giving scale, legend, north arrow, etc.

Soil Map:

- Raw data collected from **National Bureau of Soil Survey and Land Use Planning during Sept 2020.**
- Data has been geo-referenced using GIS software.
- Digitization of Soil classification zone and superimposed it over District Boundary.
- Soil classification has been filled in attribute table of the Layers.
- Final layout has been prepared by giving scale, legend, north arrow, etc.

Wildlife Sanctuary and National Park location Map:

- Raw data collected from **ENVIS Centre on Wildlife and Protected Areas during August 2020.**
- Data has been geo-referenced using GIS software.
- Digitization of Wildlife Sanctuary and National Park and superimposed it over Block Boundary.
- Wildlife Sanctuary and National Park name has been filled in attribute table of the Layers

Final layout has been prepared by giving scale, legend, north arrow, etc.

Primary Data Collection: To prepare DSR, capturing primary data or field data has also been carried out in the district. Field study involves assessment of the mineral resources of the district by means of pitting / trenching in specific interval. This provides clear picture of mineral matters characterization and their distribution over the area.

Replenishment study: One of the principal causes of environmental impacts from in-stream mining is the removal of more sediment than the system can replenish. Therefore, there is a need for replenishment study for riverbed sand in order to nullify the adverse impacts arising due to excess sand extraction. The annual rate of replenishment carried out on every river of the district to have proper assessment of the sand reserve for mining purposes.

Physical survey has been carried out by GPS/DGPS/ Total Station to define the topography, contours and offsets of the riverbed. The surveys clearly depict the important attributes of the stretch of the river and its nearby important civil and other feature of importance. This information will provide the eligible spatial area for mining.

Report Preparation: The district survey report portrays general profile, geomorphology, land use pattern and geology of the district. The report then describes the availability and distribution of riverbed sands and other minor minerals in the district. Apart from delineation the potential mining blocks, the report also includes inventorization of the minerals,

recent trends of production of minor minerals and revenue generation there from. Annual replenishment of the riverbed sand has been estimated using field observation, satellite imagery and empirical formula. The road network connecting arterial road to potential mining blocks has been identified. Potential environmental impacts of mining of these minerals, their mitigation measures along with risk assessment and disaster management plan have also been discussed. Finally the reclamation strategy for already mined out areas is also chalked out.

Demand and Utilisation of Sand

Sand is a multi-purpose topographical material. It is known as one of the three fundamental ingredients in concrete. The composition of sand is diverse. Mostly sand is made of silica which is a common element. It can also come from another source of minerals like quartz, limestone, or gypsum.

From beds to flood plains to coastlines- we can find the sand at almost everywhere. The robustness of sand has played a significant role in everyday life. We use sand practically every other day.

Sand extraction from river beds and brick earth mining for making raw bricks are the main mining activities in the district. With a spurt in construction of real estate sectors and various govt. sponsored projects, the demand for both sand and bricks has increased manifold. The extraction of sand is carried out either manually or through semi- mechanized system. The depth of mining for both river bed sand and brick earth is restricted due to statutory provision in the regulations pertaining to conservation and development of minor minerals.

River sand mining is a common practice as habitation concentrates along the rivers and the mining locations are preferred near the markets or along the transportation route, for reducing the transportation cost.

In the real world, there are a lot of situations where we can find uses of sand. Followings are the common sand uses.

1. While bunging metal, we can mix sand with clay binder for frameworks used in the foundries.
2. Sand can be used for cleaning up oil leak or any spill by dredging sand on that spill. The material will form clumps by soaking up, and we can quickly clean the mess.
3. Sand can be used as a road base which is a protective layer underneath all roads
4. Industrial sand is used to make glass, as foundry sand and as abrasive sand.
5. One creative usage of sand is serving as a candle holder. We can try putting some sand before pouring tea light or any candle in a glass. It holds the candle still and refrain the candle from rolling by giving it an excellent decoration.
6. Adds texture and aesthetic appeal to space.
7. Sand is mostly pure to handle, promptly available and economically wise.
8. We use sand in aquariums, fabricating artificial fringing reefs, and in human-made beaches
9. Sandy soils are ideal for growing crops, fruits and vegetables like watermelon, peaches, peanuts, etc.
10. Sand can light a path by filling mason jars with sand and tea light which is another inexpensive way to make a walkway glow.
11. Sand helps to improve resistance (and thus traffic safety) in icy or snowy conditions.
12. Sand is needed in the beaches where tides, storms or any form of preconceived changes to the shoreline crumble the first sand.

13. Sand containing silica is used for making glass in the automobile and food industry- even household products for the kitchen.
14. Sand is a strong strand which is used for plaster, mortar, concrete, and asphalt.
15. The usual bricks formulated of clay only are way weaker and lesser in weight than blocks made of clay mixed with sand.

GENERAL PART

3 General Profile of the district

3.1 General Information

Paschim Bardhaman district is a predominantly urban mining-industrial district in West Bengal. The headquarter of the district is Asansol. It was formed on 7 April 2017 after bifurcation of the erstwhile Bardhaman district as the 23rd district of West Bengal. The total geographical area of the district is 1603.17sq. Km. (*https://paschimbardhaman.gov.in/about-district*). A Location map of Paschim Bardhaman district is furnished below.

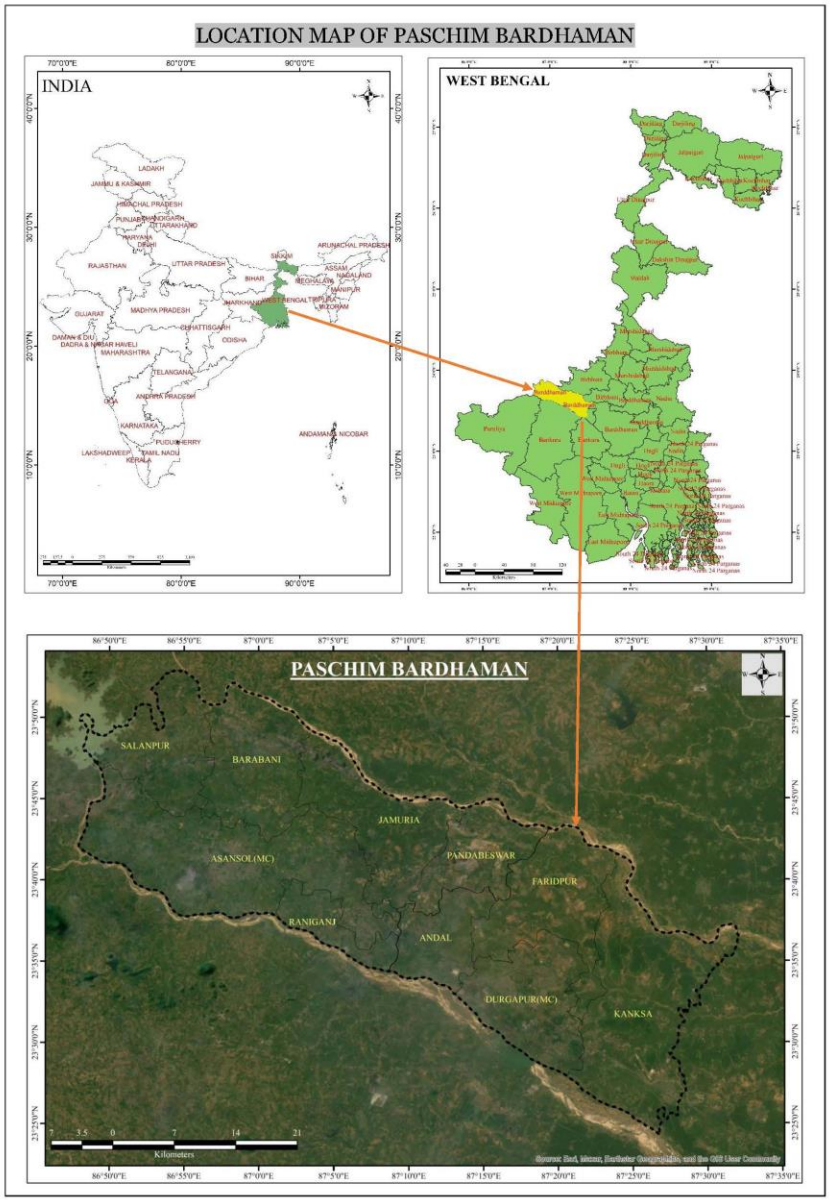


Figure 3.1: Location Map of Paschim Bardhaman

(Source: National Informatics Centre and ESRI Base Map)

Erstwhile Burdwan district stretched from the river Bhagirathi in the east to the state Jharkhand on the west. Western most subdivision was Asansol; the next one on the eastern side

of it was Durgapur subdivision. Paschim Bardhaman district is formed with these two western subdivisions of Erstwhile Burdwan district. It is bordered by Dumka district of Jharkhand and Birbhum district of West Bengal in the north; East Burdwan district is in the east. To the south, across the Damodar River are the Purulia and Bankura districts while Dhanbad district of Jharkhand lies on the western side. Two mighty rivers -the Ajay and the Damodar, flows more or less, along the northern and southern boundary of the district.

Coordinates of Asansol, the district/subdivision headquarter is 23.68˚ North and 86.99˚ East. Durgapur, the other subdivision headquarter is located at 23.48° North latitude and 87.32° East longitude.

The Paschim Bardhaman district comprises two subdivisions - Asansol Sadar and Durgapur. Asansol is the district headquarters. The DM's Office is at Kanyapur, Asansol. Each subdivision is divided into one Municipal Corporation and 4-community development blocks and which, in turn, are divided into rural areas and census towns. In total, there are two municipal corporations, eight community development blocks, 65 census towns and 62 Gram Panchayats in the district. There are two urban agglomerations (UA) - Asansol UA and Durgapur UA. Asansol UA consists of Kulti, Bhanowara, Jamuria, Jemari, Raniganj, Amkula, Murgathaul, Raghunathchak and Ballavpur while Durgapur UA consists of Durgapur, Arrah, Bamunara, Amlajora, Kanksa, Panagarh, Mankar, Shibpur, Andal, Ukhra, Kajora, Pandabeswar, Ichhapur and Madhaiganj. Asansol Sadar subdivision: The geographical area of this subdivision is 831.89 square Kms. Its population as per 2011 census is 1672659. Asansol Sadar subdivision has 9 police stations, 1 municipal corporation 4 Community Development Blocks, 4 Panchayat Samitis, 35-Gram Panchayats, 181 Mouza, and 165 inhabited villages. The single municipal corporation is at Asansol, which is comprised of Asansol UA. The census towns are - Chittaranjan, Hindustan Cables Town, Domohani, Bhanowara Majiara, Pangachhiya,Charanpur, Kunustara,Topsi,Nimsa,Chinchuria, Kenda, Parasia, Ratibati, Ch apui, Jemari (J.K. Nagar Township), Banshra, Belebathan, Chelad, Murgathaul, Amkula, Baktarnagar, Egara, Sahebganj, Raghunathchak, Ballavpur and Kendra Khottamdi (partly). The subdivision has its headquarters at Asansol. There are 35-gram panchayats under four community development blocks. Barabani block consists of eight-gram panchayats, viz. Barabani, Itapara, Nuni, Panuria, Domohani, Jamgram, Panchgachhia and Punchrah. Jamuria block consists of ten-gram panchayats, viz. Bahadurpur, Dobrana, Madantor, Tapsi, Chinchuria, Hijalgara, Parasia, Churulia, Kenda and Shyamla. Raniganj block consists of six-gram panchayats, viz. Amrasota, Egra, Ratibati, Ballavpur, Jemeri and Tirat.

Salanpur block consists of eleven-gram panchayats, viz. Achhra, Dendua, Fulberia Bolkunda, Alladi, Ethora, Rupnarayanpur, Basudevpur Jemari, Jitpur–Uttarrampur, Salanpur, Kalya and Samdi. Durgapur subdivision: The geographical area of this subdivision is 771.28 square Kms and population as per 2011 census is 1209372. Durgapur subdivision has 6 police stations, 4 community development blocks, 4 Panchayat Samitis, 27-gram panchayats, 171 Mouza, 151 inhabited villages, 1 municipal corporation and 39 census towns (1 partly). The single municipal corporation is at Durgapur. The census towns are: Siduli, Khandra, ChakBankola, Ukhra, Mahira, DakshinKhanda, Parashkol, Kajora, Harisp ur, Palashban, Dignala, Andal(gram),

Ondal, Baska, Bilpahari, Ramnagar, Dalurband, Debipur, Baidyanathpur, Mahal, Konardihi, Nabgram, Sankarpur, Haripur, Chhora, Bahula, Mandarbani, Banagram, Sirsha, Nabaghanapur, Sarpi, Ichhapur, Arra, Gopalpur, Bamunara, Amlajora, Kanksa, Prayagpur and Kendra Khottamdi (part) Durgapur–Faridpur block consists of six-gram panchayats, viz. Gaurbazar, Ichhapur, Laudoha, Gogla, Jemua and Pratappur. Kanksa block consists of seven-gram panchayats, viz. Amlajora, Bidbehar, Kanksa, Trilokchandrapur, Bankati, Gopalpur and Molandighi. Andal block consists of eight-gram panchayats, viz. Andal, Kajora, Madanpur, Sreerampur, Dakshinkhanda, Khandara, Ramprasadpur and Ukhra. Pandabeswar block consists of six-gram panchayats, viz. Baidyanathpur, Chhora, Kendra, Behula, Haripur and Nabagram.

Table 3.1: Block distribution of Paschim Bardhaman District

District	Sub Division	Block	Police Station	No of Gram Panchayat
Paschim Bardhaman	Asansol	Municipal Corporation	Asansol (North), Asansol (South), Asansol Women, Hirapur and Kulti	-
		Raniganj	Raniganj	6
		Jamuria	Jamuria	10
		Barabani	Barabani	8
		Salanpur	Chittaranjan, Salanpur	11
	Durgapur	Municipal Corporation	Durgapur Coke Oven and New Township	-
		Durgapur Faridpur	Faridpur-Durgapur	6
		Andal	Andal	8
		Kanksa	Kanksa	7
		Pandabeswar	Pandabeswar	6

(http://www.msmedikolkata.gov.in/uploads/2021/03/districtprofiles/2017-18/PASCHIM%20BARDHAMAN.pdf and District Industrial Profile, 2017-18, Paschim Bardhaman, MSME-Development Institute Kolkata, Govt of India)

A Block map of Paschim Bardhaman district is furnished below.

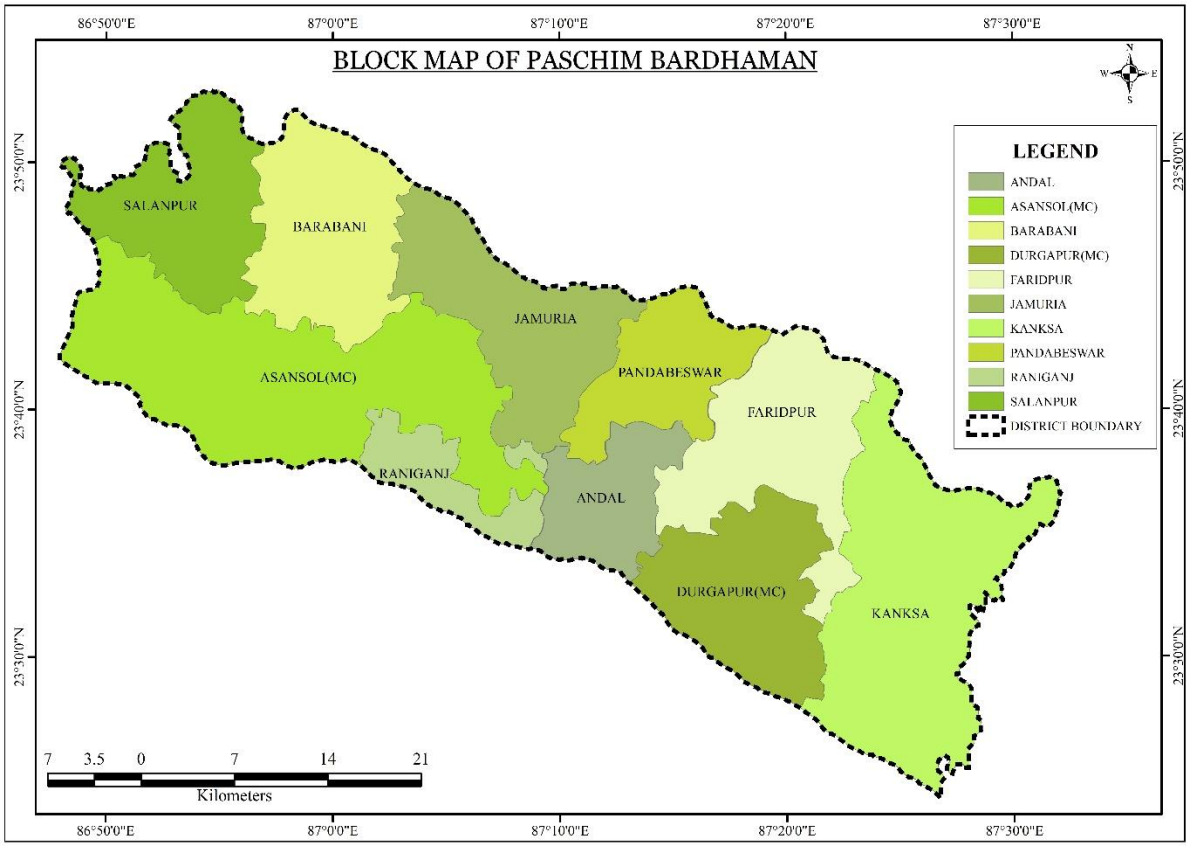


Figure 3.2: Block divisional map of Paschim Bardhaman

(Source: National Informatics Centre)

3.2 Climate Condition

Paschim Bardhaman district has a tropical climate. While the hottest month is May, the coldest is January. The monsoon season is from June to September with an annual average rainfall of 1,044 mm. Localised thunderstorms, called "Kalbaisakhi" in Bengali, are a special feature from March until the monsoon sets in. In monsoon period from June to September, wind blows from the south-west direction recognized as south-west monsoon.

During winter, *i.e.,* from December to February winds are mainly northerly or north-easterly with clear or patchily clouded sky. Temperatures are fairly cool between winter and spring. *(Ghosh et. al., 2018).*

3.2.1 Temperature

Summer

Paschim Bardhaman district experiences dry and hot summer with maximum temperature of near about≈ 40°C during summer. The district shows a fierce dry heat in the warmer months. The summers in Paschim Bardhaman usually start from month of March and last till the middle of June.

Monsoon

The arrival of the month of June marks the onset of monsoon in Paschim Bardhaman. The district receives a high average rainfall. June to September has shown maximum average rainfall with moderate temperature. The district received average rainfall of 1044 mm.

Winter

Winters in Paschim Bardhaman are pleasant and enjoyable, with mercury dropping to about 14°C or below. The winter starts from December and last till the month of February. Due to such favourable conditions, winter is deemed as the best time for the tourists to visit Paschim Bardhaman. (*Mukherjee and Banerjee, 2018).*

Monthly average temperature of Paschim Bardhaman district is furnished below.

Table 3.2: Monthly average temperature distribution of Paschim Bardhaman District

Month	Min Temp (˚C)	Max Temp (˚C)
JAN	10	24
FEB	13	28
MAR	18	32
APR	22	38
MAY	23	36
JUN	25	34
JUL	24	32
AUG	24	32
SEPT	22	32
OCT	20	31
NOV	13	29
DEC	10	26

(Climate-Data.Org)

3.3 Rainfall and Humidity

The average annual rainfall of the area is about 1044 mm. Rainfall during the monsoon period (June to September) constitutes 75 % of the annual rainfall.

The driest month is December, with 2 mm or 0.1 inch of rain. The greatest amount of precipitation occurs in July, with an average of 309 mm or 12.2 inch.

On an average the district has 70 rainy days in a year. The most prominent special weather phenomena of the district are the Nor'westers or Kalbaisakhis. Most of them strike with speed of 65 to 100 km/hr with rainfall ranging from 10 mm to 50 mm and marked by a consequent fall of temperature *(Ghosh et.al. 2018).*

The maximum and minimum relative humidity of the district during summer season varies from 75% to 85 % and 40% to 60% respectively. In winter time district's humidity varies from maximum 80% to 90 % and minimum 30% to 55% *(District Disaster Management Plan, 2015-2016).*

The following table shows the annual total rainfall recorded for the district along with the month(s) while maximum precipitation is recorded over 5 years from 2016-2020 (Table 3.3).

Table 3.3: Annual rainfall in mm recorded in Paschim Bardhaman District

The District Rainfall in mm (R/F) shown below are the arithmetic averages of Rainfall of Stations under the District						
YEAR	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**
2016	13.5	29.3	15	0	120	182.5
2017	1.2	0	32.6	28.3	171.2	255.8
2018	0	0.1	15.1	82.6	43.5	158.1
2019	0	64	16.3	47.8	129.9	90.9
2020	26.6	1.1	64.6	65.8	212	298.4
YEAR	**JUL**	**AUG**	**SEPT**	**OCT**	**NOV**	**DEC**
2016	263.9	463.5	274.5	44.3	1.9	0
2017	464.1	252.9	178.2	260.1	14.5	9.1
2018	329.7	174.7	154.3	16	0	26.7
2019	195.8	233.1	215.8	191.7	16.8	11.1
2020	338.2	262.2	128.2	81	1.7	0

https://hydro.imd.gov.in/hydrometweb/(S(5mg03haiyer0tp45adbukh3i))/DistrictRaifall.aspx
Website of Indian Meteorological Department, Govt. of India

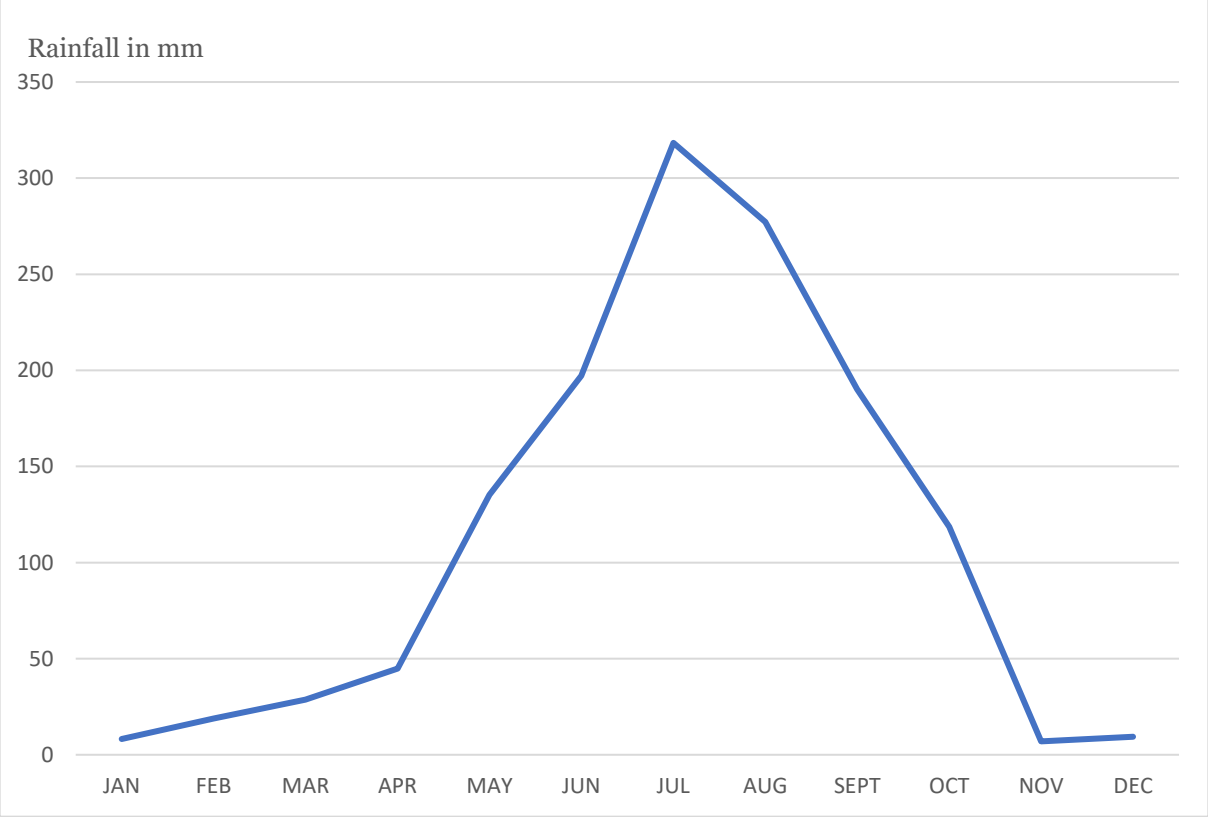


Figure 3.3: Graphical representation of the district rainfall

3.4 Topography and Terrain

Paschim Bardhaman district is a sort of an extension of the Chhotanagpur Plateau. It is a transitional zone between the Chhotanagpur Plateau, which constitutes a portion of peninsular shield in the west, and Ganga-Brahamaputra alluvial plain in the north and east. The rocky undulating topography with laterite soil is found in the western part of the district, which extends to the western part of Durgapur subdivision; barren, rocky and rolling laterite soil rising into rocky hillocks, the highest being 227 m. The eastern part of the district gradually slopes down to the rice plains of Bengal. The district is a part of the Ajay Damodar Barakar tract with the Ajay on the north, the Damodar on the south and the Barakar on the west. The Ajoy-Damodar inter-stream tract is made up of several myriads of minor rivers and streams which criss-cross the district. This diversifies the landscape and lends a special charm to the area around Asansol and Durgapur subdivision. (*http://www.msmedikolkata.gov.in/uploads/2021/03/districtprofiles/2017-18/PASCHIM%20BARDHAMAN.pdf)*

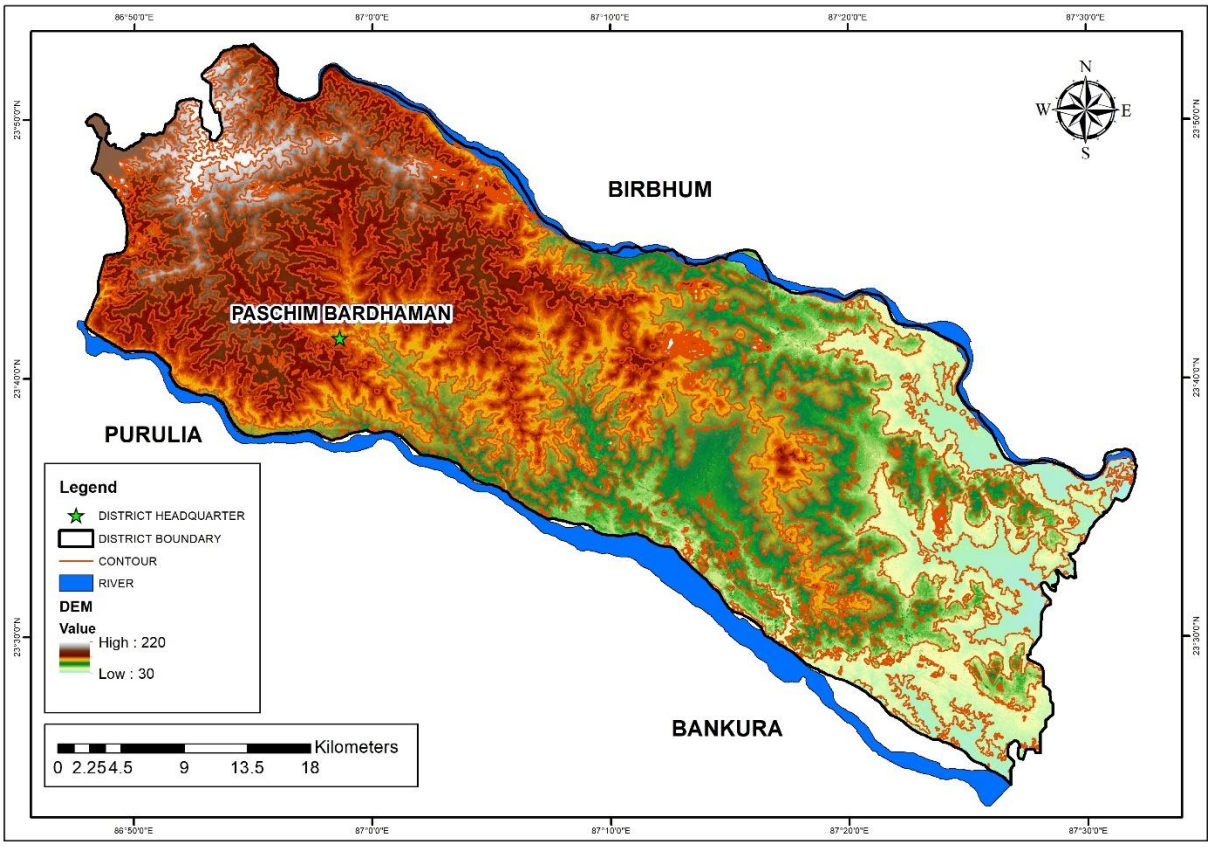
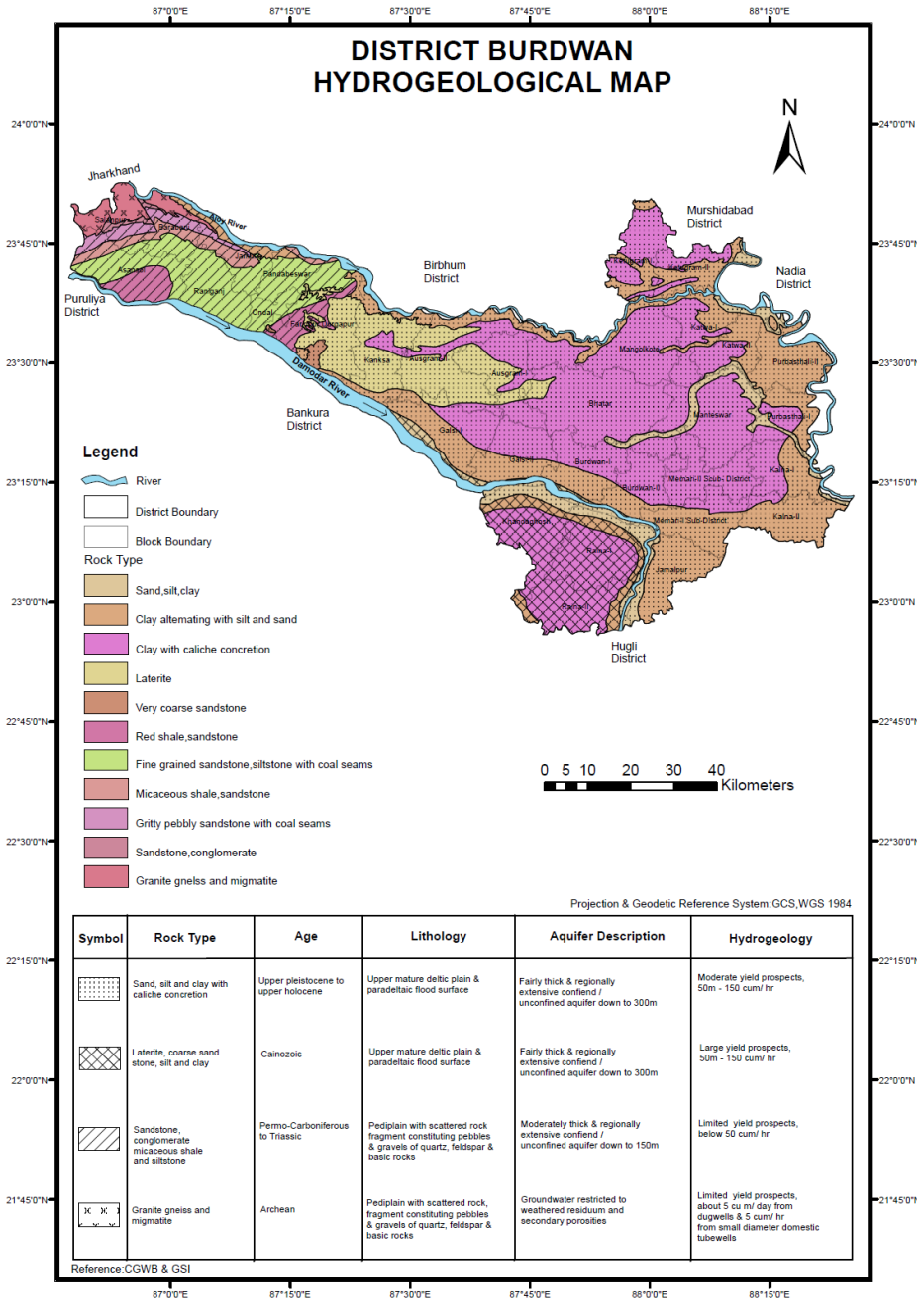


Figure 3.4: Physiographic map of Paschim Bardhaman District
(Cartosat-1, Bhuvan India)

3.5 Water courses and Hydrology

Figure 3.5 represents hydrogeological map of the district which includes Purba Bardhaman district. Rock type of the district mainly consist of Granite Gneisses, Migmatite, Schist, Sandstone with shale, Laterite, Sand, Silt and Clay. This rock group chiefly comprises the district profile. Thickness of the rock type is about 50 m and having yield value of 150 cum/day.



Symbol	Rock Type	Age	Lithology	Aquifer Description	Hydrogeology
	Sand, silt and clay with caliche concretion	Upper pleistocene to upper holocene	Upper mature deltic plain & paradeltaic flood surface	Fairly thick & regionally extensive confiend / unconfined aquifer down to 300m	Moderate yield prospects, 50m - 150 cum/ hr
	Laterite, coarse sand stone, silt and clay	Cainozoic	Upper mature deltic plain & paradeltaic flood surface	Fairly thick & regionally extensive confiend / unconfined aquifer down to 300m	Large yield prospects, 50m - 150 cum/ hr
	Sandstone, conglomerate micaceous shale and siltstone	Permo-Carboniferous to Triassic	Pediplain with scattered rock fragment constituting pebbles & gravels of quartz, feldspar & basic rocks	Moderately thick & regionally extensive confiend / unconfined aquifer down to 150m	Limited yield prospects, below 50 cum/ hr
	Granite gneiss and migmatite	Archean	Pediplain with scattered rock, fragment constituting pebbles & gravels of quartz, feldspar & basic rocks	Groundwater restricted to weathered residuum and secondary porosities	Limited yield prospects, about 5 cu m/ day from dugwells & 5 cum/ hr from small diameter domestic tubewells

Figure 3.5: Hydrogeological map of undivided Bardhaman district
http://wbwridd.gov.in/swid/mapimages/BARDDHAMAN.pdf

3.6 Ground water development

Ground water systems are the result of complex combination of different lithological and structural types within an area that together constitutes an aquifer within which ground water accumulates and moves. In the major part of the district, ground water in thick unconsolidated Quaternaries and Tertiaries deposited under fluviatile environment, the sand and/or gravel in different proportions of this formation constitute the main aquifer and they occur down to 295 mbgl in the central and eastern part of the district. Deeper aquifers occur under semi-confined to confined condition. Groundwater in the western part of Upper- Palaeozoic- Mesozoic- Tertiary sequences of Gondwana Supergroup of sedimentaries occur under both unconfined and confined conditions down to 150.35 mbgl. Groundwater in the extreme north western small part of Salanpur Block occupied by the Archaean metamorphics occurs down to a depth of about 82 mbgl under both unconfined and confined conditions down to 150.35 mbgl. It mainly occurs under unconfined condition in the dug well zone and under semi confined to confined condition in the deeper horizons. In Bardhaman district, ground water occurs in semi-confined to confined aquifer conditions in the depth span of 12.00-38.00 mbgl, 31.00-55.00 mbgl and 70.00-88.00 mbgl.

http://cgwb.gov.in/Regions/GW-year-Books/GWYB-%202016-17/WB%20&%20Andaman.pdf

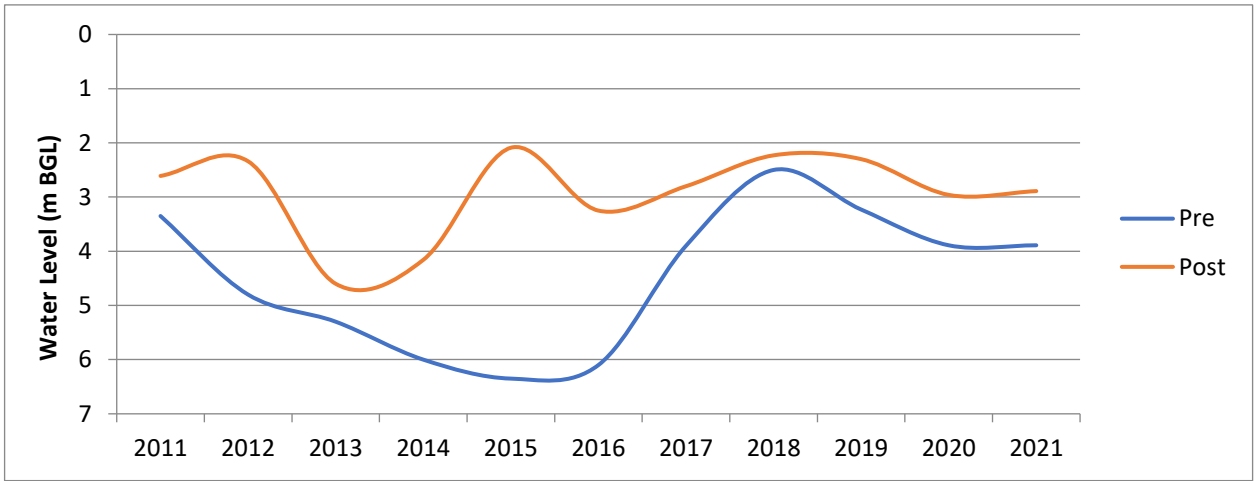
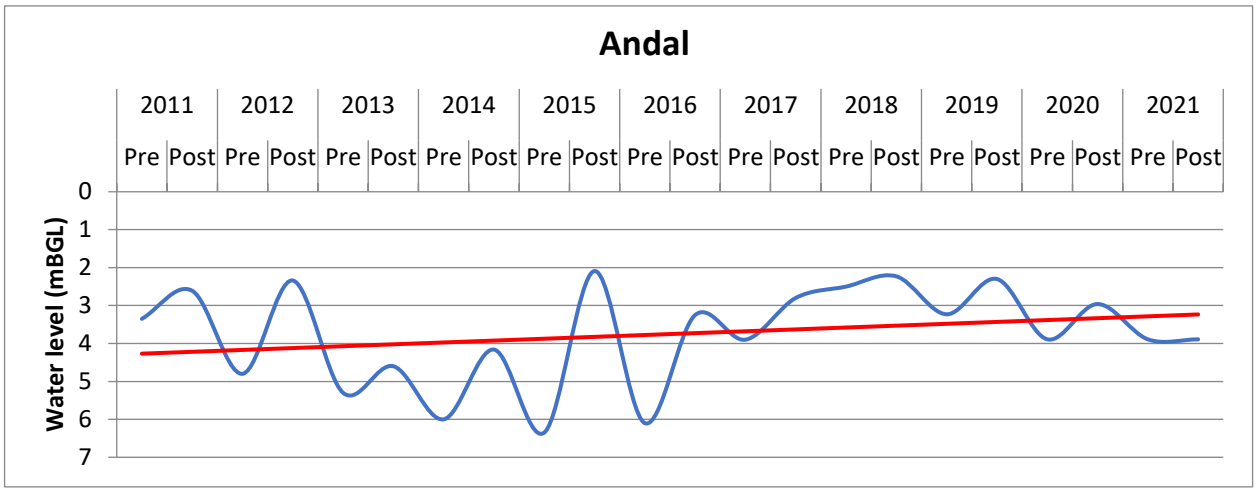


Figure 3.6: Graphical representation of pre-monsoon and post-monsoon data of two wells

Hydrographs showing variation in water level observed in between 2011 to 2021 in the district is given in Figure 3.7.


Andal
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Pre
Post
Water level (mBGL)
0
1
2
3
4
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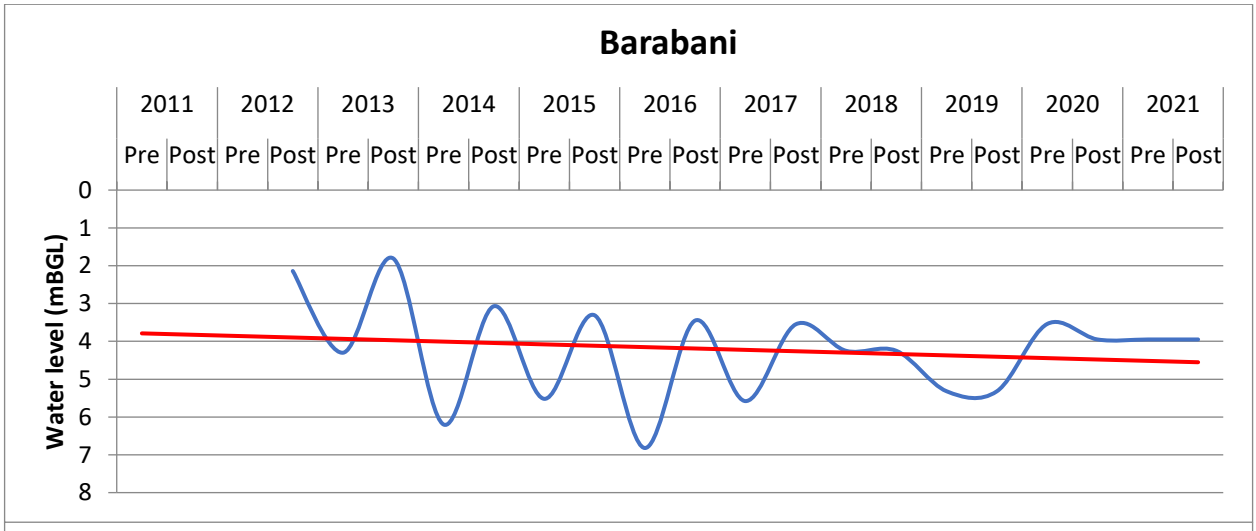
6
7


Barabani
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Water level (mBGL)
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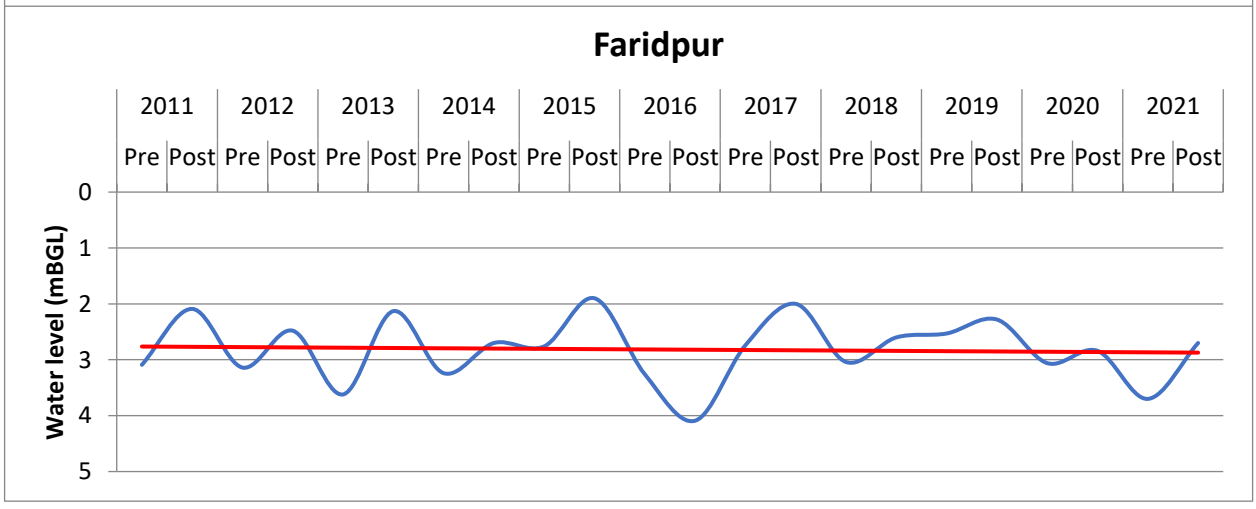
Faridpur
2011
2012
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2021
Pre
Post
Water level (mBGL)
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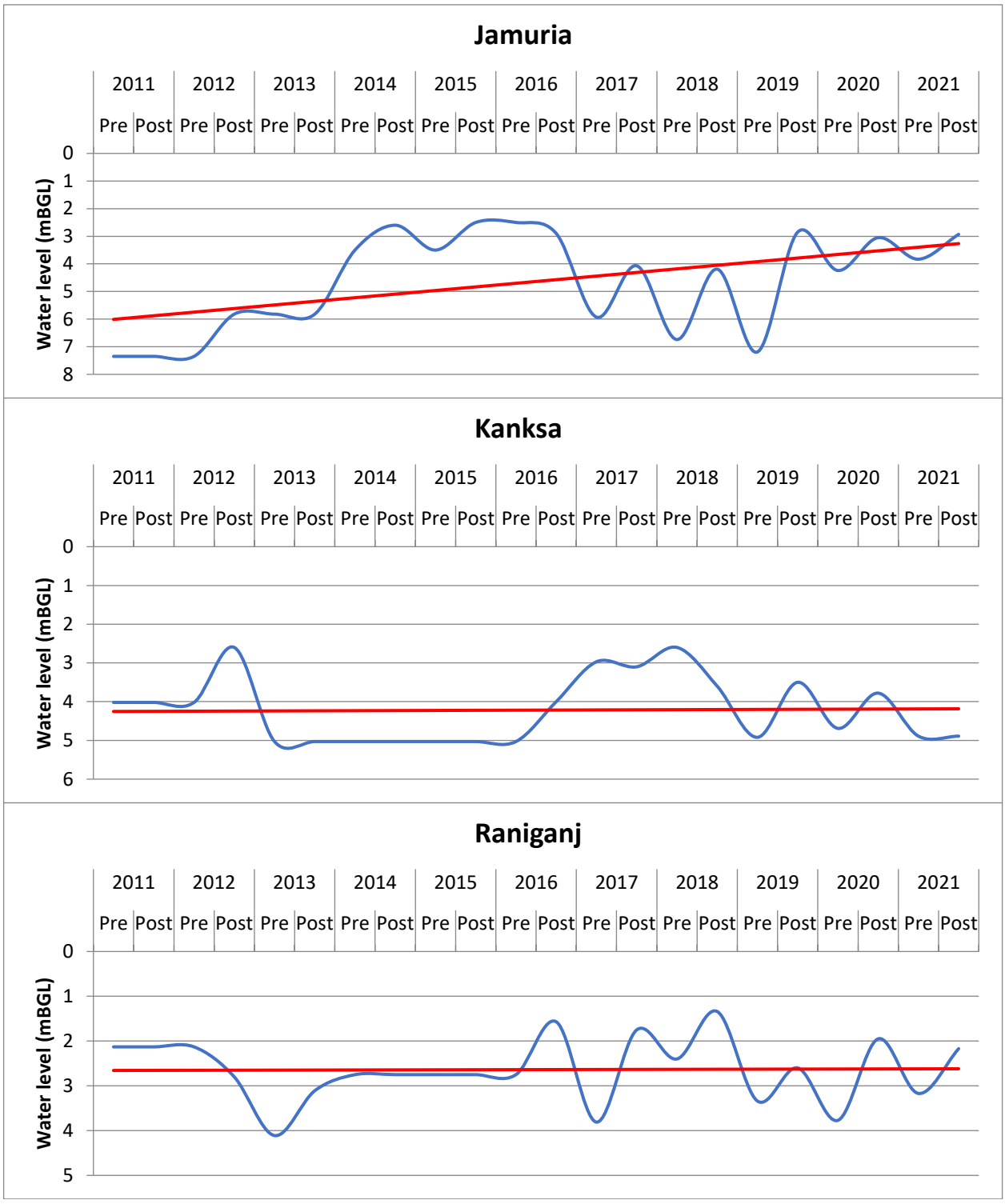

Jamuria
2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post
Water level (mBGL)
0 1 2 3 4 5 6 7 8
Kanksa
2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post
Water level (mBGL)
0 1 2 3 4 5 6
Raniganj
2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post
Water level (mBGL)
0 1 2 3 4 5

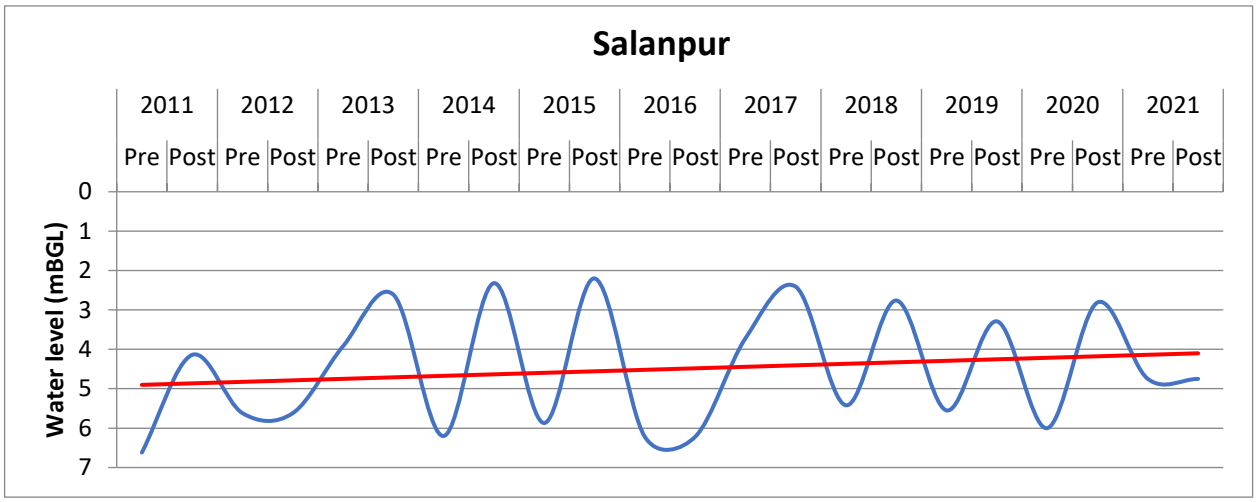


Figure 3.7: Block wise Hydrograph showing variation of water level during 2011 to 2021

3.7 Drainage System

Damodar River running west to south-east, is the major steam in the area. Damodar River is a river flowing across this state and Jharkhand. Rich in mineral resources, the valley is home to large-scale mining and industrial activity. The Damodar and its tributaries have been somewhat tamed with the construction of several dams. It has a number of tributaries and sub-tributaries, such as Barakar, Konar, Bokaro, Haharo, Jamunia, Ghari, Guaia, Khadia and Bhera. The Damodar Valley is spread across Hazaribagh, Ramgarh, Koderma, Giridih, Dhanbad, Bokaro & Chatra districts in Jharkhand and Bardhaman and Hooghly districts in West Bengal and partially covers Palamu, Ranchi, Lohardaga and Dumka districts in Jharkhand and Howrah, Bankura and Purulia districts in West Bengal with a command area of 24,235 km². The drainage in the study area is mainly Damodar River and its tributaries. The secondary tributaries are Talma, Choupai, Barajuri and Barjor.

Ajay River running west to south-east. The Ajay River starts the journey from the Chakai block of Jamui (Origin of Ajay River) and then enters Jharkhand state near Devipur. Afterward, at Simuji, it enters West Bengal near Chittaranjan. After entering West Bengal, first, it flows between West Bardhaman district and Jharkhand, and then West Bardhaman district and Birbhum district, and forms the borders between the West Bardhaman district and Jharkhand state, and West Bardhaman district and Birbhum district. Finally, the Ajay River enters Purba Bardhaman district's Katwa subdivision at Nareng village in Ketugram police station and joins Bhagirathi River in Katwa town. The 288 km long (179 miles) river has its 152 km (94 miles) in West Bengal alone. And its catchment area is 2300 square miles or 6000 square kilometers. While the Ajay flows through Alluvial plains in the Bradhaman district, its upper reaches flow through hilly areas with laterite soil. Previously, one could find dense forests filled with trees like Palas,

Piyasal, and Saltreese in the valley of the Ajay River. However, in recent times, the forests are being cleaned due to different activities like mining.
https://www.riversgraphy.com/ajay-river/#Course

Paschim Bardhaman system of the district is further explained in Chapter 7.2.

Table 3.4: Rivers and tributaries in Paschim Bardhaman District

Watershed	Flow Regime	Rivers and Tributaries	Length in Paschim Bardhaman (km)	River Area (sq.m)
Damodar	Middle	Damodar	78.31	79869025.45
		Barakar	12.32	3095649.66
Ajay	Middle	Ajay	82.60	41637865.85

A Drainage map of Paschim Bardhaman district is furnished as Figure 3.8 and in and in Plate 1A.

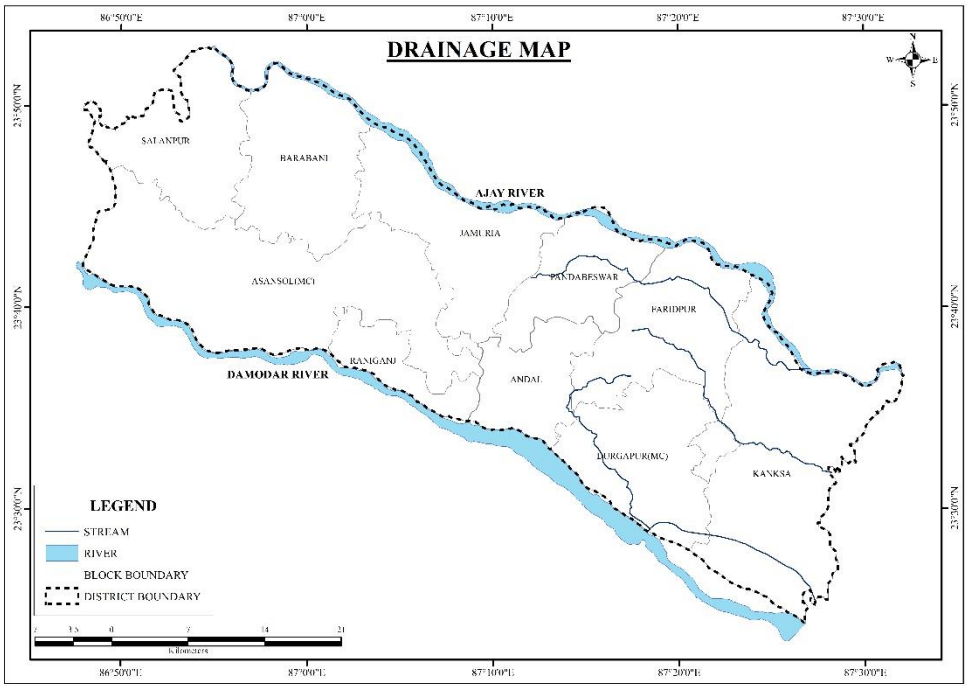


Figure 3.8: Drainage map of Paschim Bardhaman District

(Source: National Informatics Centre)

3.8 Demography

As per the 2011 Census of India data, Paschim Bardhaman district (after bifurcation of Bardhaman district in 2016), had a total population of 2,882,031. There were 1,497,479 (52%) males and 1,384,452 (48%) females. Population below 6 years was 322,268. 2,351,954 (81.61%) lived in urban areas, while 530,077 (18.39%) lived in rural areas.

As per the 2011 census data the total number of literates in Paschim Bardhaman district, after bifurcation of Bardhaman district in 2017, was 2,015,056 (78.75% of the population over 6 years) out of which males numbered 1,136,990 (85.44% of the male population over 6 years) and

females numbered 806,010 (65.55% of the female population over 6 years). Scheduled castes and scheduled tribes made up 628,568 and 161,946 which is 21.81% and 5.62% of the population respectively.

In the 2011 census Hindus numbered 2,442,414 and formed 84.75% of the population in Paschim Bardhaman district. Muslims numbered 384,027 and formed 13.32% of the population. Sikhs were 14,754 forming 0.51% of the population, almost entirely in urban areas such as Asansol and Durgapur. Christians numbered 12,636 and formed 0.44% of the population. Other religions (including indigenous religions such as Sarna) numbered 42,954 and formed 1.49% of the population.

According to the Census 2011, 58.18% of the population in what is now Paschim Bardhaman district spoke Bengali, 26.78% Hindi, 7.64% Urdu and 4.47% Santali as their first language. *https://en.wikipedia.org/wiki/Paschim_Bardhaman_district*

Table 3.5: Demographic distribution of Paschim Bardhaman District

Subdivision	Head quarters	Area km2	Population-2011	Rural Population %-2011	Urban Population %-2011
Paschim Bardhaman district	Asansol	1,603.17	28,82,031	18.39	81.61
Durgapur	Durgapur	771.28	12,09,372	20.78	79.22
Asansol Sadar	Asansol	831.89	16,72,659	16.67	83.33

(Census, 2011)

Figure 3.9 shows the population distribution in Paschim Bardhaman District.

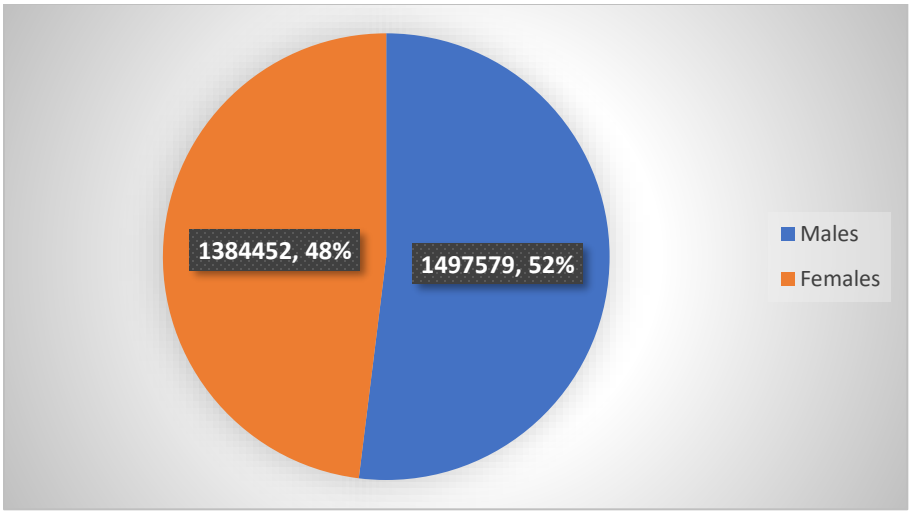


Figure 3.9: Population distribution in Paschim Bardhaman District

(Census, 2011)

Figure 3.10 shows the literacy rate in Paschim Bardhaman District.

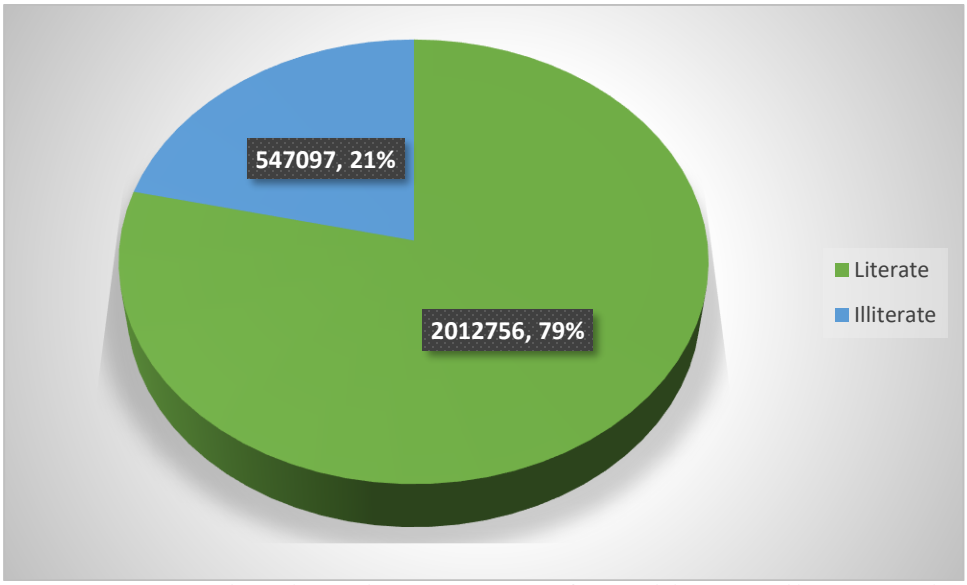


Figure 3.10: Map showing Literacy rate of Paschim Bardhaman District
(Census, 2011)

3.9 Cropping pattern

Cropping intensity may be defined as the ratio between net cultivated area and total cultivated area. It indicates the intensity of cultivation in a region in a crop year. Higher will be the gross cropped area higher will be the intensity of cropping. Suitable soil, climatic condition, irrigation facilities help the farmers to grow more than one crop and thus increasing the intensity of cropping. Paschim Bardhaman district covers total cropped area of 77735 ha as of 2014-15.
District Industrial Profile, 2017-2018, Paschim Bardhaman, Ministry of MSME, Govt. of India.

According to the report on, Agriculture Contingency Plan for District, Paschim Bardhaman (2007 - 08), high intensity of cropping (184%) was observed in Paschim Bardhaman. Paddy is the most important crop of the district and covers maximum of the gross cropped area. Among commercial crops, jute, sugarcane, potato and oilseeds are major crops. Major and most common cropping practice patterns of the district consist of paddy-wheat-vegetables, paddy-potato-sesame, paddy-vegetable-mustard and jute-paddy-vegetables.
District Disaster Management Plan, 2015-2016

The gross cropped area of the district is 832.1 ha, net sown area is 452 hectares, and area sown more than once is 380.1 hectares.
Agriculture Contingency Plan of Bardhaman

3.10 Land Form and Seismicity

The district Paschim Bardhaman is a fragment of Chhotanagpur plateau (*District Industrial Profile, 2017 - 18*). The western part of Paschim Bardhaman district shows the presence of hillocks and the elevated part of the Chhotanagpur Plateau gradually fuses to the riverine plains. Paschim Bardhaman district is prone to disasters like flood, drought, cyclone etc., and in the past the district has experienced the intimidations of such disasters and falls under moderate damage risk zone in respect to seismicity proneness (*http://wbdmd.gov.in/pages/earthquake.aspx*). Paschim Bardhaman district is categorized under seismically active zone - III i.e., moderate seismic intensity zone. Bureau of Indian Standards, based on the past seismic history, grouped

the country into four seismic zones, viz. Zone - II, Zone –III, Zone-IV and Zone-V. Of these, Zone V is the most seismically active region, while Zone II is the least.

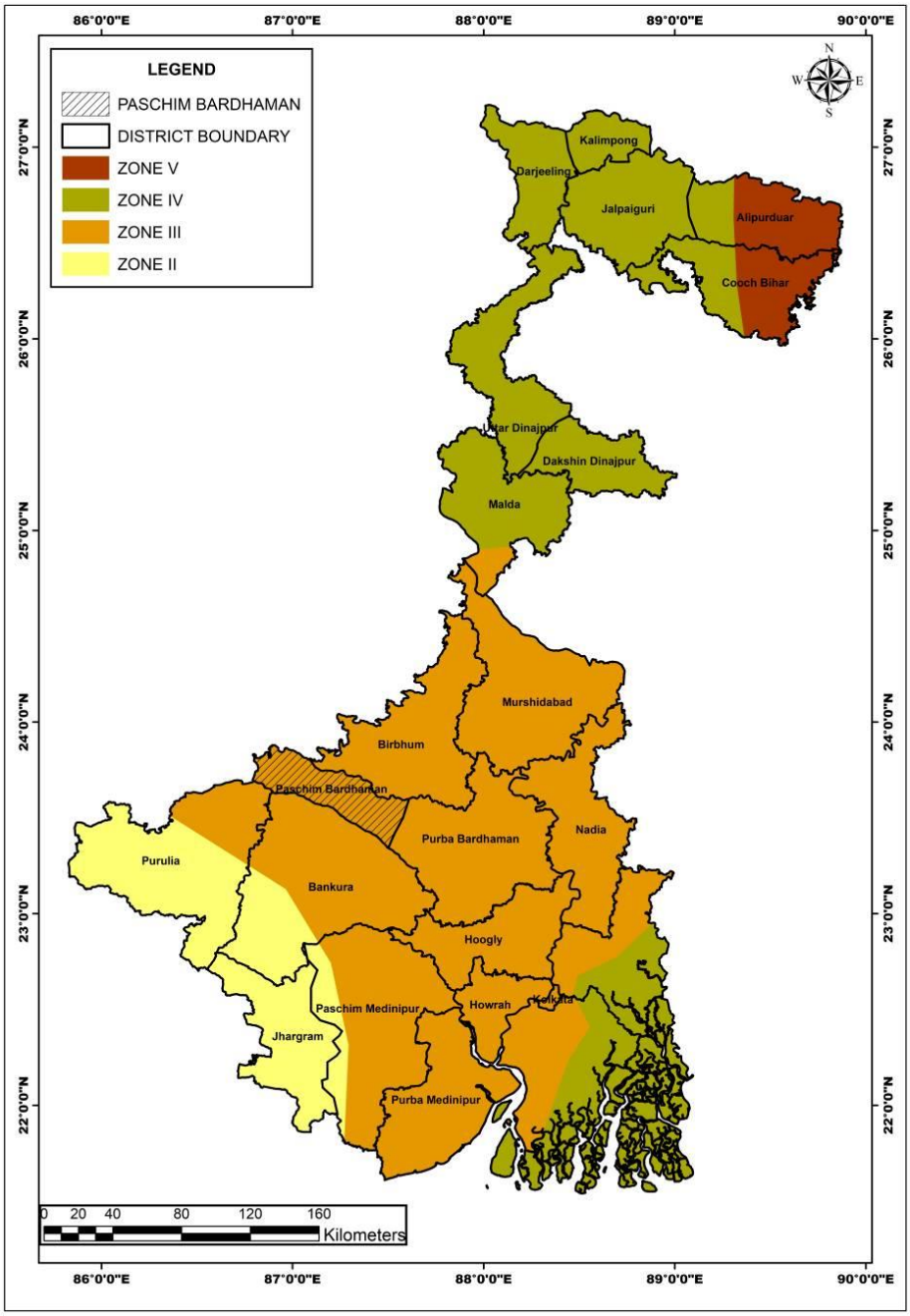


Figure 3.11: Earthquake zonation map of West Bengal highlighting the Paschim Bardhaman district position

https://pib.gov.in/PressReleasePage.aspx?PRID=1740656

Table 3.6: Details of vulnerable areas of paschim Bardhaman District
http://wbdmd.gov.in/writereaddata/uploaded/DP/DPPaschim%20Bardhaman20500.pdf

Type of hazard	Time of Occurrence	Vulnerable areas
Flood	June to October	AMC Ward no. 41, 27, 88, 90, 79, 08, 32, 09, 19, 70
		Jamuria -SidhaPur Darbar Danga
		Raniganj- Nupur
		Andal- Madanpur, Babuisol, Srirampur, Ramprasadpur
		Pandaveswar- Gobindpur, Konda, Metal Dhoara
		Durgapur-Faridpur- Gogla, Notundanga, Pansiuli, Gourbazar, Srikrishna Pur
		Kanksa- Shilampur, Amlajora, Shibpur
		Barabani- Roshna, Putulia, Parulberiya, Amulia
		Salanpur Bathanbari, Sidhabari, Kalipathar, Brindabani
		DMC- Ward no. 36, 36, 38, 39, 41, 43, 13, 14, 33, 34
Draught	March to May	Almost All the Blocks
Sunstroke	April to June	Entire Blocks
Cyclone	-	Entire Blocks
Earthquake	-	Entire Blocks

The Damodar River was once upon a time known as “Sorrow of Bengal” since this is flooded almost every year which receives huge quantum of water from the upland of the Chhotanagpur Plateau. Along with the catchment water, the river also receives a huge quantum of sediment loads. Several attempts have been undertaken from the historic period for flood control which has affected only after the Independence in 1948 when “Damodar Valley Corporation” has been formed. Damodar River was earlier known as the "River of Sorrows" as it used to flood many areas of Bardhaman, Hooghly, Howrah and Medinipur districts. Even now the floods sometimes affect the lower Damodar Valley, but the havoc it wreaked in earlier years is now a matter of history. The floods were virtually an annual ritual. In some years the damage was probably more. Many of the great floods of the Damodar are recorded in history — 1770, 1855, 1866, 1873–74, 1875–76, 1884–85, 1891–92, 1897, 1900, 1907, 1913, 1927, 1930, 1935 and 1943. In four of these floods (1770, 1855, 1913 and 1943) most of Bardhaman town was flooded. The first dam was built across the Barakar River, a tributary of the Damodar River at Tilaiya in 1953. The second one was built across the Konar River, another tributary of the Damodar River at Konar in 1955. Two dams across the rivers Barakar and Damodar were built at Maithon in 1957 and Panchet in 1958 respectively. Both the dams are some 8 kilometres (5 mi) upstream of the confluence point of the rivers. These four major dams are controlled and maintained by DVC. Durgapur Barrage was constructed downstream of the four dams in 1955, across the Damodar River at Durgapur, with head regulators for canals on either side for feeding an extensive system of canals and

distributaries. In 1978, the government of Bihar (that was before the formation of the state of Jharkhand) constructed the Tenughat Dam across the Damodar River outside the control of DVC. These dams restrict the regular water flow of the river which has definitely affected in the flood management of the downstream areas. However, the upper dams receive huge sediment loads from the uphill plateau region and get obstructed in the dams. Almost every year, during late monsoon, the upper dams releases water due bankfull situation of the river. The discharge water contains loads of sediments together. Usually, the river sediments are being divided into, bed load, suspended load and dissolved load. The sand depositions are form of bed load. These sediments ultimately got deposited in the lower regime of the river. The sediment load is mostly fine sands which has a potential for development as a construction material. Since the river is traversing coal mining potential areas, sands are also used for stowing as well.
https://en.wikipedia.org/wiki/Damodar_River

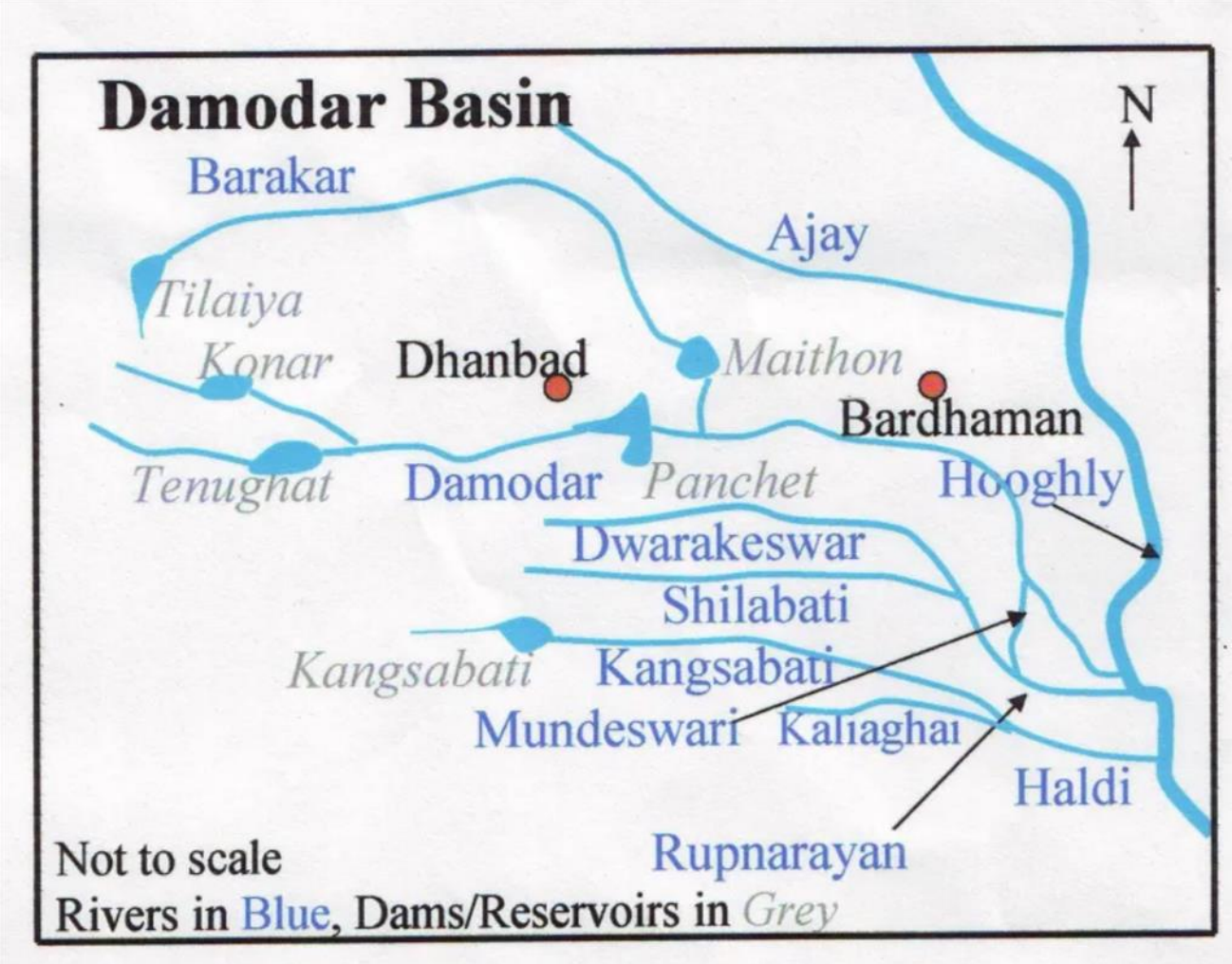


Figure 3.12: Map showing Dams/Reservoirs on Damodar River

3.11 Flora

Before 2017, Paschim Bardhaman was recognized as an important part of Bardhaman district. As the district experiences a climate which is transitional between CWg3 and AW1 types, where 'C' stands for 'warm temperate rainy climates with mild winter','W' for 'dry winter not compensated for by total rain in the rest of the year', 'g3' for 'eastern Ganges type of temperature trend' and 'AW1' for 'tropical savanna climates' (*http://Barddhaman.nic.in/home.htm*) and lies between Chhotanagpur Plateau and Gangetic plains for this reason it is rich in biodiversity. The forests of the district are characterized by tropical dry deciduous attributes. In the wasteland, scrub sand bushes are found (*Ghosh, et.al. 2018*).

The uplands of Asansol subdivision and the lateritic area of the district are in places covered with the predominant and principal floral species i.e. Sal (*Shorearobusta),* Mahua (*Madhuealatifolia*), Palas (*BuleaMonosperma*), Bans (*Bambusaarundinacea),* Arjun (*TerminaliaArjuna),* Shireesh (*Albiziasaman)* and Kend *(Diospyrosmelanoxylon).* The flora of the district is characterized by the arborescent species such as Simul (*Salmaliamalabarica*), Neem (*Azadirachta indica*), Amlaki (*Phyllanthus embica*), Narikel (*Cocosnucifera*), Khejur (Phoenixdactylifera),Tal (Borassusflabellifer),Bot (Ficusbengalensis), Asvattha (Ficusreligiosa,Krishnachuda (Caesalpinia pulcherrima), Aam (*Mangifera indica*) and shrubby species suchasashsheoda (Glycosmis pentaphylla), Pianj, Rasun, Rajanigandha (Polyanthes tuberosa),Ghentu or Bhat (*Clerodendroninfortunatum*), Gulancha (*Tinosporacordifolia*), Tulsi (*Ocimumsanctum*), Shiora (Streblus asper) and Dumur (*Ficus hispida*).

The common plants in hedges and waste land sarelal-bharenda (Jatrophagossypifolia), Ban-okra (Urenalobata), Ulu (Imperataarundinecea) etc. The common aquatic and marsh weeds found in the jheels and swamps in the easternparts of the district are Keshe (Saccharum spentaneum), Bena (Andropogon squarrosus), Ganj or pata-sola (Vallisneria spiralis), Jhangi (*Hydrilla verticillata*.), Pond weed (Potamogeten indicus), Kesar-dam (Jussiaea repens), Kush (Eragrostiscynosuroides), common Jhangi (Utriculariastellaris), Pana (Lemnapancicostata), Waterhyacinth (Eichorniacrassipes), Hogla (*Typhaangustata*), Padma (*Nelumbiumspeciosum*) etc. *District Gazetter, Bardhaman.*

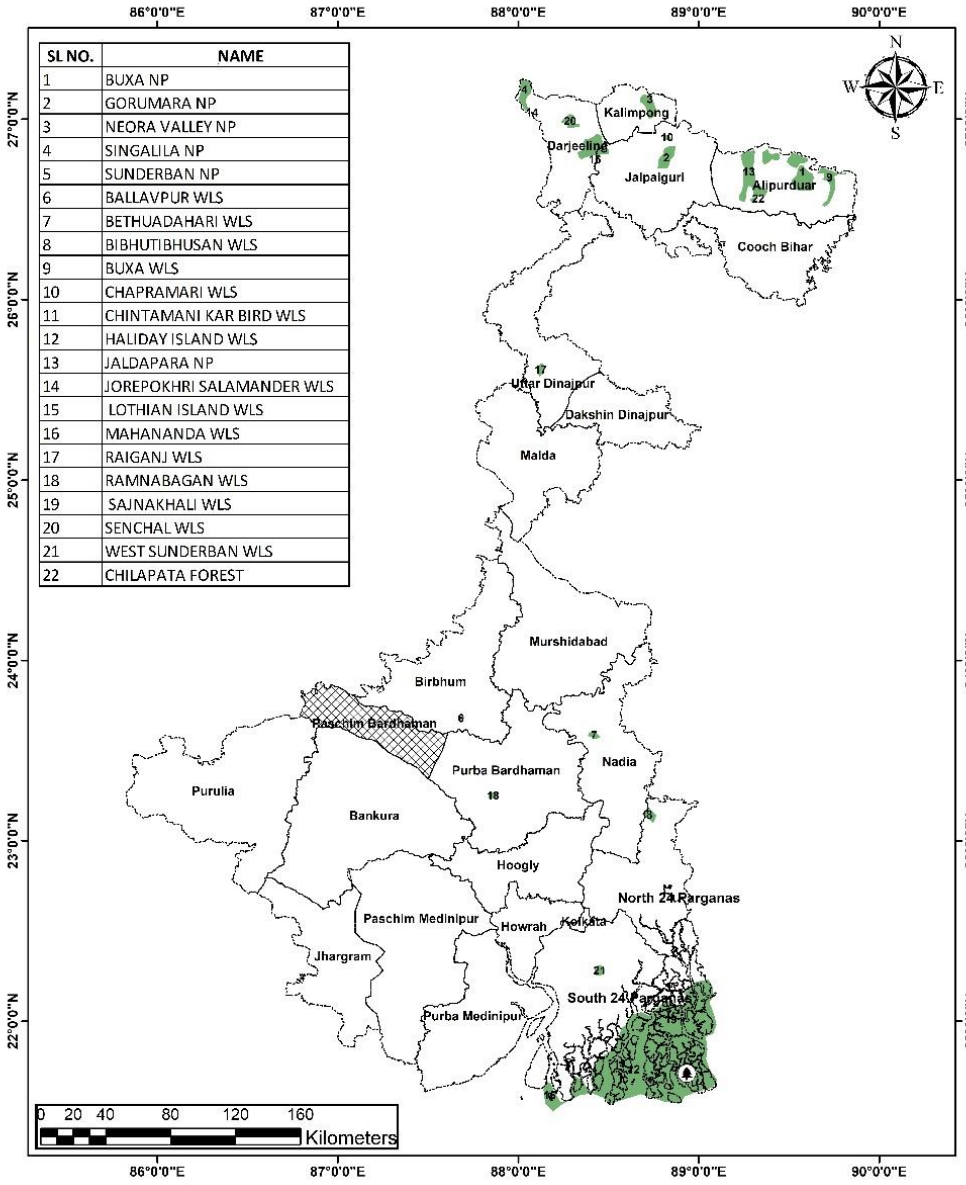
3.12 Fauna

Paschim Bardhaman has a rich ecological and wild life heritage. Wild life of Paschim Bardhaman includes diversified mammals, birds, reptiles, amphibians, fishes, birds and reptiles. A newly created research organization, and biodiversity portal of district of West Bengal named as, Biodiversity of Paschim Bardhaman, a sister-group of „Birding Durgapur" has already explored and documented that till date only in Durgapur 238 species of bird, 99 species of butterfly, and about more than 60 species which is a positive

indication of larger exploration in whole district. The group is also engaged to explore the species of plant, mollusc, amphibian, reptiles etc. (*https:// biodiversity of paschim Bardhaman.weebly.com*).

The District Gazetter, Bardhaman, depicted that, the mammalian carnivore of the district comprises of leopard (*Panthera pardus*), wolf (*Canis lupus*), hyaena (*Hyaena hyaena*), jackal (*Canis aureus*) and other smaller species, but hyaenas are not so common. Tigers (*Panthera tigris*) were formerly common in the district, especially in the jungles of the Asansol subdivision adjoining the Jharkhand, but have now a days entirely disappeared from this province of Paschim Bardhaman. Wolves are in frequently found and are mostly met with in the jungles north of Kanksa. Wild pigs (*Sus scrofa*) are numerous throughout the district and monkeys (*Cercopithecidaesp*.) also abound including the variety known as Hanuman.

The common avifauna of the district are pea-fowl (*Pavocristatus*), jungle-fowl (*Gallus sp*.), jungle crow (*Corvus macrorhynchos*), house crow (*Corvus splendens*), treepie (*Dendrocittavagabunda*), common babbler (*Turdoidescaudata*), gold frontedchloropsis (*Chloropsisaurifrons*), red-ventedbulbul (*Pycnonotuscafer*), red whiskeredbulbul (Pycnonotusjocosus), redspottedbluethroat (Lusciniasvecica), brown-backed robin (Erythropygiahartlaubi), Shama (Copsychusmalabaricus), Tickell's blueflycatcher (Cyornistickelliae), paradise flycatcher (Terpsiphonesp.), woodshrike (Tephrodornispondicerianus) , black drongo (Dicrurusmacrocercus), tailor bird (Orthotomussp.), streaked fantailwarbler (Cisticola juncidis) golden oriole (Oriolusoriolus), common mayna (Acridotheres tristis), piedmayna (Gracupica contra), white-backed munia (Lonchura striata), white throated munia (Euodicemalabarica), spitted munia (*Lonchurapunctulata*), red munia (*Amandavaamandava*), yellow-throatedsparrow (Petroniax anthocollis), house sparrow (Passerdomesticus), woodpecker (*Picidae sp*.), Indiacuckoo (Cuculus micropterus), pied crested cuckoo (Clamatorjacobinus), koel (*Eudynamyss*p.), parakeet (Melopsittacusundulatus), Nilkantha (*Coraciasbenghalensis*), bee-eater (Meropidaesp.), kingfisher (Alce dinessp .), hornbill (*Bucerotidaesp*), hoopoe (*Upupidaesp*.), hornedowl (*Bubovirginianus*), spotted owlet (Athene brama), jungle owlet (*Glaucidium radiatum*), griffon vulture (Gypsfulvus), long-billed vulture (Gyps indicus), scavenger vulture (Neophron percnopterus), lagger falcon (*Falcojugge*r), small spotted eagle (*Clangaclanga*), brahminykite (*Haliasturindus*), pariahkite (*Milvus migrans*), sparrow hawk (*Accipiter nisus*) various types of pigeon and dove, goose, duck, teal, lap wing, white necked stork and several varieties of egret and heron. Distric's wildlife heritage is significantly enriched by some species of various migratory birds. Specifically, the low-lying swampy areas of Paschim Bardhaman are an excellent line of migration habitat of birds and provide a very good shelter for the migratory birds throughout the winter season**.**



SL NO.	NAME
1	BUXA NP
2	GORUMARA NP
3	NEORA VALLEY NP
4	SINGALILA NP
5	SUNDERBAN NP
6	BALLAVPUR WLS
7	BETHUADAHARI WLS
8	BIBHUTIBHUSAN WLS
9	BUXA WLS
10	CHAPRAMARI WLS
11	CHINTAMANI KAR BIRD WLS
12	HALIDAY ISLAND WLS
13	JALDAPARA NP
14	JOREPOKHRI SALAMANDER WLS
15	LOTHIAN ISLAND WLS
16	MAHANANDA WLS
17	RAIGANJ WLS
18	RAMNABAGAN WLS
19	SAJNAKHALI WLS
20	SENCHAL WLS
21	WEST SUNDERBAN WLS
22	CHILAPATA FOREST

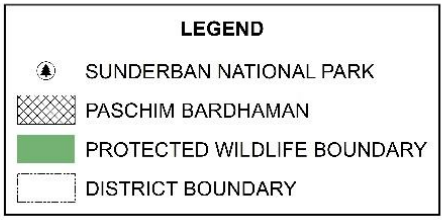


Figure 3.13: District location with respect to Wild Life Sanctuary of West Bengal

(Source: http://wiienvis.nic.in/)

In the hilly areas, pythons (*Pythonidae sp*.) are found occasionally. Poisonous snakes are very common and include several kinds of cobra (*Serpentes sp*.), the kraits (*Bungarussp*.) and the deadly Russell's viper (*Daboiarusselii*). Other most frequently seen varieties are the Dhamna (*Ptyasmucosa*) and various species of harmless grass snakes (*Natrixnatrix*).

4 Geomorphology

4.1 General Landforms

General landform of an area represents natural and/or human influenced facets of the earth's crust and also involves portraying vertical and horizontal dimensions along with their arrangements. Distinctive landforms embrace not only hills, mountains, plateaus, plains, valleys but also include ocean front landscapes, submerged topographies, ridges of mid-oceans, volcanoes and the great ocean basins.

Paschim Bardhaman is a sort of an extension of the Chota-Nagpur Plateau. Almost rectangular shaped district Paschim Bardhaman is fundamentally an intermediate portion between Chotanagpur Plateau that constitutes a part of peninsular shield in west and alluvial plain of Ganga – Brahamaputra river system in the north and east. The district is influenced by the rivers e.g., Ajay on the north; Damodar on the south and the Barakar on the west and therefore, the district shares a portion of the Ajay Damodar - Barakar tract. Numbers of stream sand water ways criss-crosses the district and lends differentiated landscape. Ajay-Damodar inter-stream tract basically adorned the areas in and around the Asansol and Durgapur subdivision (*District Industrial Profile, Paschim Bardhaman, Ministry of MSME, and Government of India 2017-2018*).

The surface gradient of this province is southerly towards the Damodar and westerly towards the Barakar, northerly towards the Ajay (*Peterson, J.C.K.1910: 7*). The western part of Paschim Bardhaman district illustrates the occurrence of hillocks and the elevated area of the Chhotanagpur Plateau progressively slopes down to the riverine plain areas(*http://wbdmd.gov.in/pages/earthquake.aspx*). Report of National Bureau of Soil Survey & Land Use Planning, Indian Council of Agricultural Research, Regional Centre Calcutta (2013) that is entitled, "Soil survey and land use plan of Bardhaman district (West Bengal)" incarnated that, the western most province of Bardhaman district which is currently separated as Paschim Bardhaman district can be ordered into four (4) classes of slope profile e.g., (i) gently sloping predominantly in western part of the districts,(ii)gently sloping to moderately sloping in Salapur and Barabani areas,(iii) gently sloping to very gently sloping profile in Raniganj, Pandabeshwar, Andal, Asansol, parts of Durgapur and (iv)very gently sloping belt along the river bank of Ajay.

4.2 Soil and rock pattern

The rocky undulating topography with laterite soil found in Paschim Bardhaman district is a sort of extension of the Chhotanagpur plateau. For ages the area was heavily forested and infested with plunderers and marauders. This soil is found between the rivers Ajoy and Damodar, part of the district, which is highly porous, poor in organic matter content and acidic in nature. A soil map and their distribution is furnished in table 4.1 and figure 4.1.

Table 4.1: Description of District soil type

Code	Description
W036	Very deep, poorly drained, fine cracking soils occurring on level to nearly level low-lying alluvial plains with clayey surface associated with very deep, imperfectly drained, fine soils
W065	Very deep, moderately well drained, fine loamy soils occuring on very fently sloping flood plain with loamy surface, moderate erosion and moderate flooding associated with very deep, well drained, sandy soils
W067	Very deep, imperfectly drained, coarse loamy soils occuring on very gently sloping to undulating dissected upland with loamy surface and moderate erosion associated with very deep, moderately well drained, fine loamy soils
W068	Very deep, imperfectly drained, fine loamy soils occuring on very gently sloping to undulating dissected upland with loamy surface and moderate erosion associated with very deep, moderately well drained fine loamy soils
W069	Very deep, poorly drained, fine loamy soils developed on old alluvium occurring on gently sloping to undulating dissected upland with loamy surface and slight erosion associated with very deep, poorly drained, fine soils
W070	Very deep, poorly drained, fine soils occurring on nearly level upland with loam surface associated with very deep, poorly drained, fine soils
W094	Deep, well drained, loamy soils occurring on very gently sloping to undulating plain with loamy surface and moderate erosion associated with deep, moderately well drained, loamy soils
W096	Shallow, moderately well drained, gravelly loamy soils occurring on very gently sloping to undulating plain with gravelly loamy surface and moderate erosion associated with shallow, well drained, fine loamy soils
W107	Very deep, well drained, coarse loamy soils occurring on very gently sloping valleys on undulating plateau with loamy surface and moderate erosion associated with very deep, moderately well drained fine loamy soils
W114	Shallow, moderately well drained, coarse loamy soils occurring on gently sloping to undulating plain with gravelly loamy surface and moderate erosion associated with shallow, imperfectly drained, gravelly loamy soils

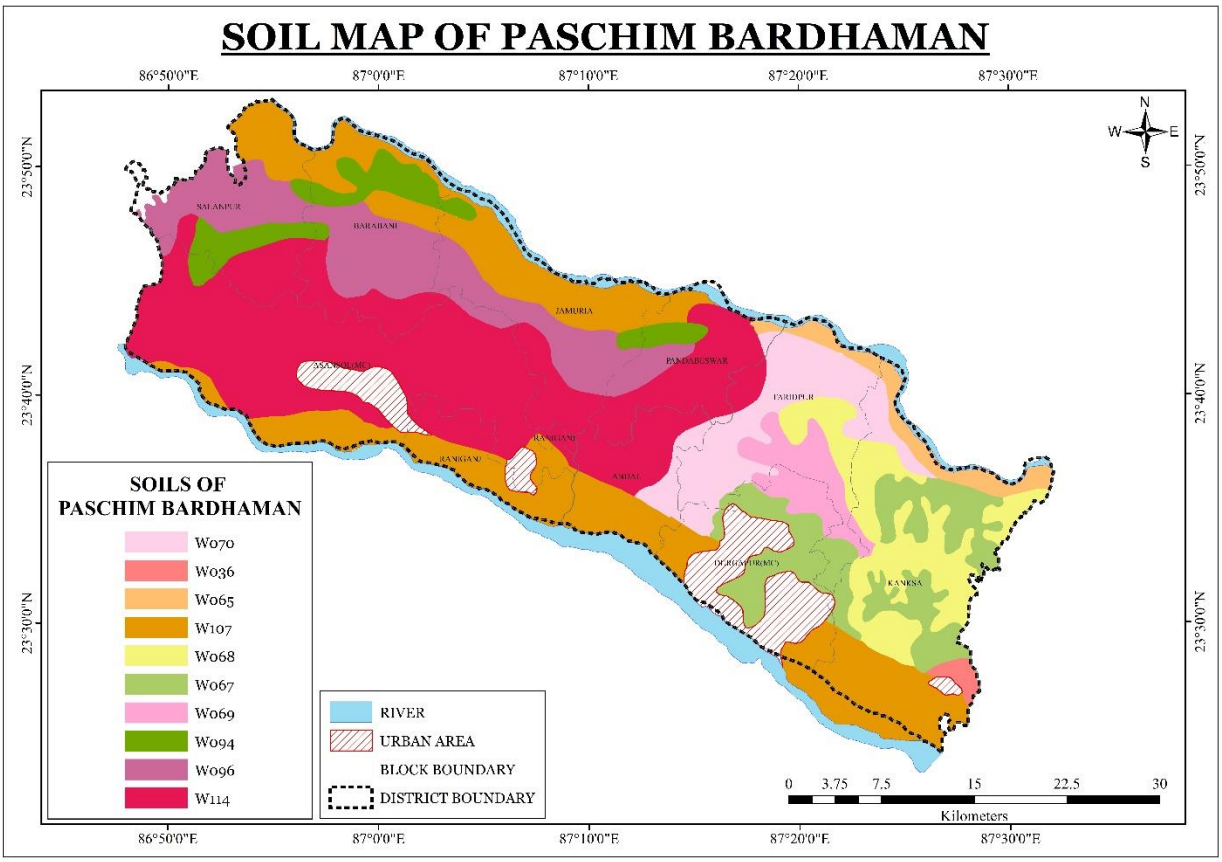


Figure 4.1: Soil Map of Paschim Bardhaman District
(https://esdac.jrc.ec.europa.eu/content/west-bengal-soils-sheet-2)

4.3 Different geomorphologic units

Geomorphologically the district consists of three (3) major physiographic zones namely (i) Floodplain (ii) Pediplain with scattered rocks (iii) Upper mature deltaic plain. As the geomorphology of the region is the expression of surface or subsurface litho-stratigraphy, therefore, the geomorphological profile of the district is transparently bestowing the soils are heterogeneous in their morphological characteristics such as soil depth, colour, texture, structure, drainage, slope etc. Paschim Bardhaman district lies at the eastern fringe of Chhotanagpur Plateau and possesses predominantly sandstone, conglomerate micaceous shale and siltstone along with granite gneiss and migmatite type of rocks. The region is highly eroded and dissected. The district consists of three (3) major physiographic zones are described briefly.

Upper Mature Deltaic Plain

This region is built up of the deltaic fans of the streams flowing from the western hills. (*Soil survey and land use plan of Bardhaman district, West Bengal National Bureau of Soil Survey & Land Use Planning, Indian Council of Agricultural Research, 2013*).

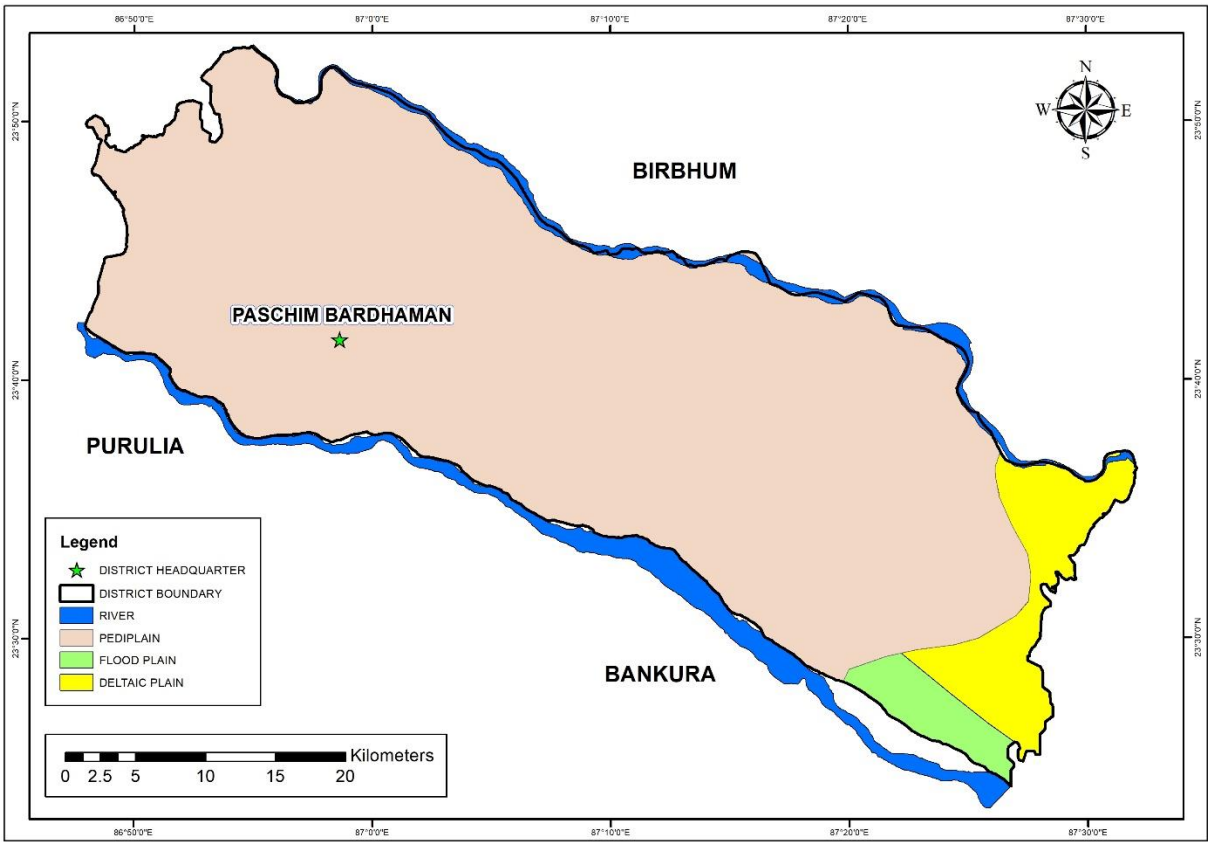


Figure 4.2: Geomorphological map of Paschim Bardhaman District

(Resourcesat-1and2 – Liss-3, Bhuvan India)

Pedi-plain with Scattered Rock

Pediplain with scattered rock fragment constituting pebbles & gravels of quartz, feldspar & basic rocks of Permo Carboniferous to Triassic and Archean ages (*Projection & Geodetic Reference System: GCS, WGS 1984; CGWB & GSI, 1984*). The western part of the district comprises the inter-fluve of the rivers.

Flood Plain

Flood plain is formed due to successive floods and deposition which gradually raised the tract above flood level. The riverine area has developed through alluviation. The river gradient has decreased from east to west. This part is mostly inter-bedded layers of sand and clay. This region extends from 80meter contour which is formed of alluvium brought by the river Damodar and Ajay. The surface is undulating, interspersed with low ridges and valleys (*Soil survey and land use plan of Bardhaman district, West Bengal National Bureau of Soil Survey & Land Use Planning, Indian Council of Agricultural Research, 2013*). Flood plain is mainly restrained in areas under jurisdiction of Faridpur and Kangsa police station.

5 Land use pattern of the district

Table 5.1 gives land utilization static of Paschim Bardhaman district. Figure 5.1 is pie diagram representing broad land use pattern of the district and Figure 5.2 is Land Use Land Cover map of the district.

Table 5.1: Classification of Land Utilisation Statistics in the district

(In thousand hectares)

Year	2009-10	2010-11	2011-12	2012-13	2013-14
Reporting Area	698.76	698.76	698.76	698.76	698.76
Forest Area	21.16	21.16	21.16	21.16	21.16
Area under Non-agricultural use	208.53	211.56	211.92	213.77	214.19
Barren & unculturable land	1.37	0.86	0.65	0.57	0.44
Permanent pastures & other grazing land	0.22	0.26	0.33	0.15	0.06
Land under misc. tree groves not included in Net area sown	1.42	1.99	0.87	0.83	0.98
Culturable waste land	5.6	4.88	6.09	4.45	3.74
Fallow land other than Current fallow	1.37	1.24	1.46	1.25	1.09
Current fallow	4.98	4.35	4.31	3.7	3.31
Net area sown	454.11	452.46	451.97	452.88	453.79

http://wbpspm.gov.in/publications/District%20Statistical%20Handbook

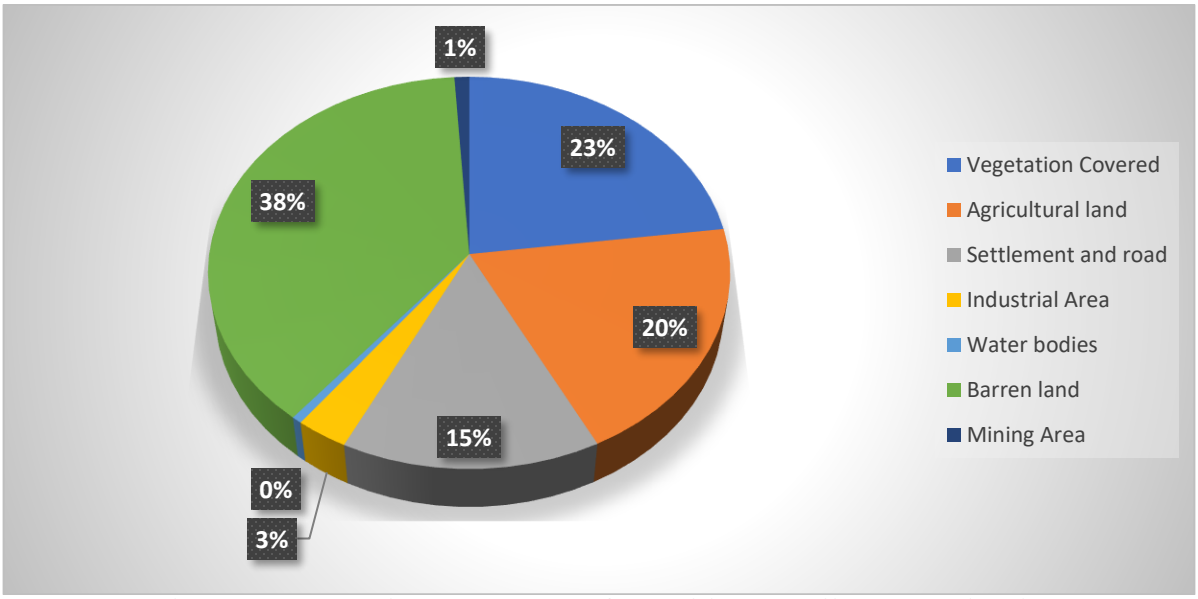


Figure 5.1: Land use pattern of Paschim Bardhaman District

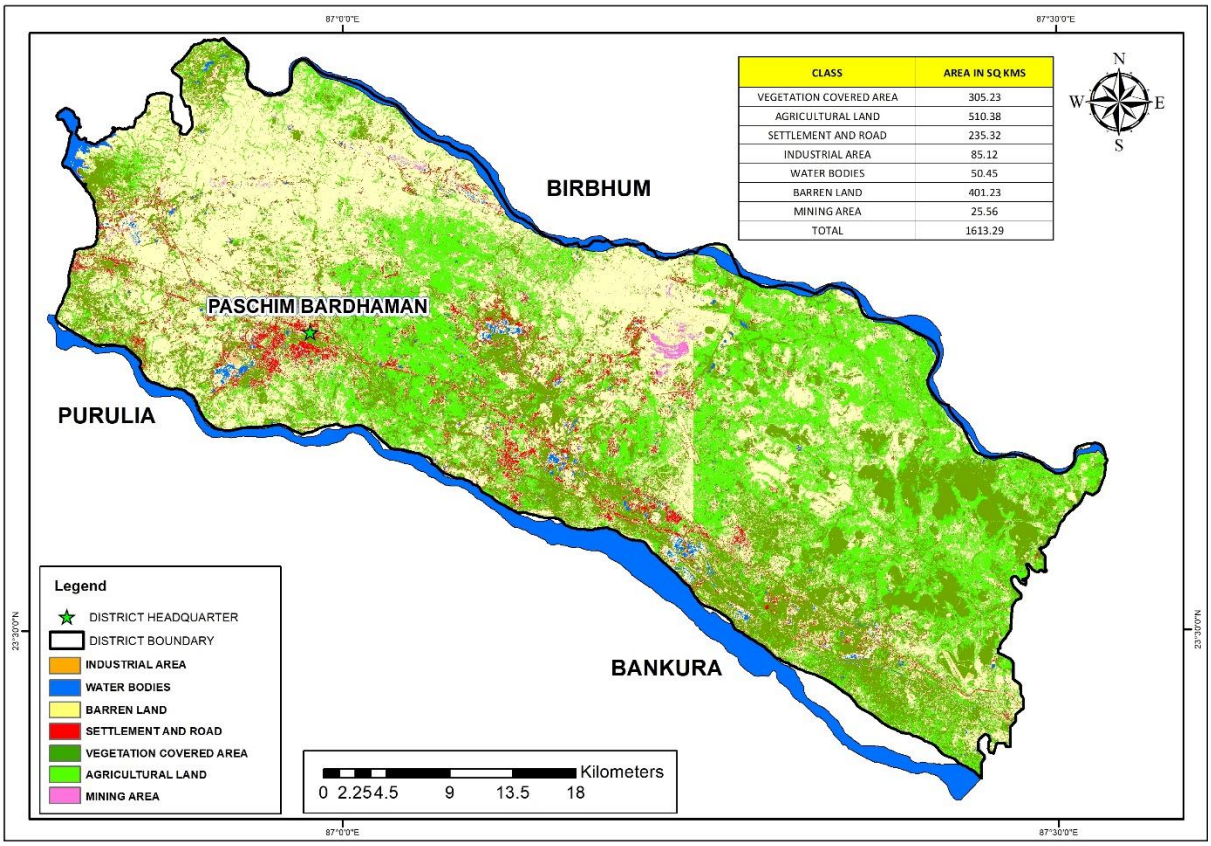


Figure 5.2: Land Use Land Cover map of Paschim Bardhaman District
(Resourcesat-1 and 2 – Liss-3, Bhuvan India)

5.1 Forest

The forest zones of the district are chiefly situated in the lateritic and red soil high lands in the Asansol subdivision. The Durgapur Forest also covers large part of neighbor district, Birbhum, beyond the Ajay River while the forest area within the Asansol subdivision forms a part of the forest area of Dumka District of Jharkhand (*http://Bardhaman.nic.in/home.htm*).

Upto the middle of 19th century, the region was intact from any kind of significant development due to its uncultivable red lateritic soil with dense and wild impenetrable jungles. The detection of presence of coal in the 18th century led to industrialization of the western part of the subdivision.

Most of the forests in the western part of the subdivision have been cleared but in the eastern part, some still exist in Kanksa and its adjoining Faridpur-Ukhra area. Kanksa Block accounts for 67.20% of the total notified forest area of the district and divided in to 5 forest beats. Ramnabagan Wildlife Sanctuary is spread over a part of this forest. The forests of West Bardhaman district mainly comprises of Sal and Kend trees. Besides these, Mohua, Palas, Simul, Neem, Shireesha, Arjun and Ashan are also available. The main forest products are timber, kendu leaves and fuel. The aggregate forest area of West Bardhaman is 43455.73 acre including plantation and notified forest area is 24878.04 acre. *District Industrial Profile, 2017-2018, Paschim Bardhaman, Ministry of MSME, Govt. of India*.

Table 5.2: Classification of Forest Area, Out-turn of Forest Produce, Revenue and Expenditure of Forest Department

Item	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Area by class of Forest	-	-	-	-	-	-
Reserved forest	hectare	2762.58	2762.58	2762.58	3367.46	3367.46
Protected forest	"	19361.71	19361.71	19361.71	20567.33	20567.33
Unclassed state forest	"	5544.94	5544.94	5544.94	5386.65	5386.65
Khas forest	"	-	-	-	-	-
Vested waste land	"	-	-	-	-	-
Forest owned by corporate bodies	"	-	-	-	-	-
Forest owned by private individuals	"	-	-	-	-	-
Forest owned by civil authorities	"	-	-	-	-	-
Total		**27669.23**	**27669.23**	**27669.23**	**29321.44**	**29321.44**
2. Forest Produce	-		-	-	-	-
Timber	Thousand Cu. Metre	0.77	0.71	0.62	1.72	1.53
Fuel	"	4.65	1.85	2.14	8.51	7.07
Pulpwood	"	4.45	4.09	0.49	0.55	0.49
Pole	Number	9573	6864	12265	85406	81097
Post	"	23949	1246	42295	32909	1145
3. Revenue & Expenditure	-					
Revenue	Rs. in thousand	11,482.83	18,254.19	16815.74	34623.85	27886.02
Expenditure	"	1,04,857.32	124689.85	1,33,219.33	110065.53	134894.02

(http://wbpspm.gov.in/publications/District%20Statistical%20Handbook)

5.2 Agriculture and Irrigation

As of 2014-15 the total cropped area of the district is 77735 ha, the non-agricultural land is 62998 hectares, and the cultivable barren land is 2202 ha [*District Industrial Profile, 2017-2018, Paschim Bardhaman, Ministry of MSME, Govt. of India*].

On an average about 58% of the total population belongs to the agricultural population while the non-agricultural sector accounts for the remaining 42%. The eastern, northern, southern and central areas of the district are extensively cultivated but the soils of the western portion being extreme lateritic type are unfit for cultivation except

in the narrow valleys and depressions having rich soil. Rice is the most important crop of the district and covers maximum of the gross cropped area. Among commercial crops, jute, sugarcane, potato and oilseeds are major crops. Productivity of the major crops grown in the district is indicated below. Major cropping patterns include paddy, wheat, vegetables, paddy, potato, sesame, paddy, vegetable, mustard, jute *etc.* Irrigation is the application of controlled amounts of water to plants at needed intervals. Irrigation helps to grow agricultural crops, maintain landscapes, and re-nutritioning the sequestrated soils in dry areas and during dry periods and/or the time of less than average rainfall. Currently, Government attempts to minimize the drawbacks of agricultural issues by certain extent of advancement in the economic condition, education, technology manures, pesticides, irrigation facilities *etc*. The major sources of irrigation in the district are ponds, dug wells, LI points, drift/shallow tube-wells, rivers, creeks and canals [*District Disaster Management Plan, 2015-2016*].

As per "Agriculture Contingency Plan of Bardhaman" the major agricultural crops grown in the district are rice, wheat, pulses, oilseeds, jute and potato. Jute and rice are the kharif crops grown in the district, whereas rice, wheat, pulses, oilseeds and potato are the rabi crops grown in the district.

Apart from this, livestock rising, poultry farming and fisheries form major part of the agriculture of the district. The net irrigated area of the district of Bardhaman is 331.6 ha, the gross irrigated area is 693.3 ha, and the rain fed area is 138.8 ha. The sources of irrigation in the district are canals, tanks, open wells, bore-wells; lift irrigation schemes, micro irrigation practices etc.

Table 5.3: Production of Principal Crops in the district of Paschim Bardhaman

(Kilogram per hectare)

Crops		2009-10	2010-11	2011-12	2012-13	2013-14
(1)		(2)	(3)	(4)	(5)	(6)
Foodgrains :						
1.	**Rice**	**3050**	**2960**	**2951**	**3240**	**3338**
	Aus	2912	2852	3013	3095	2690
	Aman	2960	2893	3006	3092	3161
	Boro	3225	3093	2813	3628	3793
2.	Wheat	2443	2193	2413	2864	2691
3.	Barley	-	-	980	997	988
4.	Maize	2152	2080	2091	2097	2091
5.	Other Cereals	-	-	-	-	-
Total Cereals		**3048**	**2958**	**2948**	**3237**	**3335**
6.	Gram	618	1731	996	1585	1193
7.	Tur	214	911	329	1325	1250
8.	Other Pulses	767	985	1117	957	960
Total Pulses		**759**	**997**	**1094**	**1027**	**984**

Total Foodgrains		**3042**	**2947**	**2939**	**3228**	**3324**
Oil Seeds :						
1.	Rapeseed & Mustard	945	991	866	1168	1013
2.	Linseed	216	293	149	263	-
3.	Other Oil seeds	848	909	1069	1154	1077
Total Oil seeds		**901**	**951**	**955**	**1163**	**1041**
Fibres * :						
1.	Jute	17.2	21.1	18.3	15.5	21.2
2.	Mesta	11.6	0.3	0.9	12.5	13.2
3.	Other Fibres	3.0	7.8	5.0	5.1	5.0
Total Fibres		**17.1**	**20.8**	**18.3**	**15.48**	**21**
Miscellaneous crops :						
1.	Sugarcane	80830	95064	45180	45524	64403
2.	Potato	41117	37645	27675	32578	22336
3.	Tobacco	-	-	-	-	-
4.	Tea	-	-	-	-	-
5.	Chillies (dry)	1498	1501	1542	1461	1466
6.	Ginger	1910	1910	1901	1994	1944
Total Miscellaneous crops		**40042**	**37225**	**26876**	**31547**	**22532**

(http://wbpspm.gov.in/publications/District%20Statistical%20Handbook)

5.3 Horticulture

Practice of garden cultivation and management is known as Horticulture. Horticultural crops, i.e., fruits and vegetables acquire a place of importance as protective food. Horticulture provides much needed health supporting vitamins, minerals enriched foods. Besides, their value in human consumption, horticultural crops play an important role in commerce, particularly in export trade and processing industry in Paschim Bardhaman district. The major horticulture vegetable crops grown in the district are brinjal, cabbage, cauliflower, cucurbits, ladies finger, tomatoes and the major horticulture fruit crops grown in the district are mango, banana, papaya, guava, jackfruit etc.

Table 5.4: Production of Fruits in the district

Name of Fruits / Vegetables	Prouduction (Thousand tonnes)				
	2009-10	2010-11	2011-12	2012-13	2013-14
(1)	(7)	(8)	(9)	(10)	(11)
A. Fruits :					

Mango	16.54	17.54	17.63	17.90	10.00
Banana	16.49	16.89	16.76	16.80	19.86
Pineapple	0.96	0.96	0.87	0.60	0.55
Papaya	14.23	14.33	14.51	14.54	17.50
Guava	8.93	9.13	9.36	9.40	9.46
Jackfruit	6.99	6.99	7.10	6.75	6.88
Litchi	2.85	2.85	2.89	2.90	2.91
Mandarin Orange	-	-	-	-	-
Other Citrus	3.16	3.26	3.87	3.88	3.95
Sapota	0.25	0.25	0.25	0.26	0.29
Others	3.92	3.96	4.15	4.20	4.25
Total	**74.32**	**76.16**	**77.39**	**77.23**	**75.65**

(http://wbpspm.gov.in/publications/District%20Statistical%20Handbook)

Located principally in temperate climate the district possesses an excellent floral diversity. The important flowers grown in the district and their production during 2009-2014 are shown in Table 5.5.

Table 5.5: Production of Flowers in the district

Name of Flower	Production					
	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
(1)	(8)	(9)	(10)	(11)	(12)	(13)
Rose	Crore Cut flower	0.150	0.150	0.150	0.104	0.092
Chrysanthemum	"	-	-	-	-	-
Gladiolus	"	0.039	0.039	0.040	0.050	0.046
Tuberose	"	0.059	0.059	0.059	0.065	0.056
Marigold	' 000 MT	0.223	0.203	0.203	0.231	0.238
Jasmine	"	-	-	-	-	-
Seasonal Flower	"	0.058	0.038	0.040	0.051	0.050
Misc. Flower	"	0.039	0.035	0.035	0.039	0.039

(http://wbpspm.gov.in/publications/District%20Statistical%20Handbook)

5.4 Mining

The economic evolution of any society solely is influenced by the concrete infrastructure of the local industry. Paschim Bardhaman is accomplished with an economically rich infrastructure, suitable for any sort of industrial asset. Durgapur of Paschim Bardhaman is one of the biggest industrial hubs of India and was planned as an integrated industrial town. The state of West Bengal is candidly blessed with the enormous natural resources including prospective minerals and being a part of Chotonagpur plateau Paschim Bardhaman is extremely enriched with a number of minerals. The traditional industrial base of the district is principally sustained by coal, iron and steel and has experienced a rapid development and new industrial ventures, which comprises of minor minerals too. The district has a rich minor mineral base which is their liable indicator of bountiful convenience for commercial use and economic development. Basically, the accessibility and distribution of mineral resources are their flection of antiquated paragenetic ore-geological sequence. The Raniganj coalfield was the native land of the coal industry of India. Asansol sub-division of this district lies upon a mammoth coal reserve of the best type of non-coking coal reserves in the country and hence, the mining activity was started in this province as early as 1774, however efficient withdrawal of coal initiated in the second half of the nineteenth century by depending upon this coal stockpile

[*District Industrial Profile, 2017-2018, Paschim Bardhaman, Ministry of MSME, Govt. of India*].

Originally the area was known as 'Raniganj Coalfield' which has huge numbers of collieries that extracted coal from these reserves until all of non-coking coal mines were nationalized in 1975 and renamed as 'Eastern Coalfields Limited (ECL) which is the second highest coal reserve in India, after Talcher. 'Raniganj Coalfield' expanses over 443.50 sq.km area and is currently estimated to have over 30.61 billion tons of coal. There blocks of Raniganj Coalfield e.g., Raniganj measures spread over Raniganj, Pandaveswar, Kajora, Jhanjra, Bankola, Kenda, Sonepur, Kunustoria, Satgram, Sripur, Sodepur and partly over Salanpur area & Barakar measures. Barakar measures cover two areas of ECL, Salanpur and Mugma. Coal of Raniganj measures exhibits high calorific value, high volatile content, extended flame and quick ignition which create high preference in high heat energy consuming industries like glass, ceramics, fertilizers, refractory etc. The area is also highly prospectus for coal-bed methane. Introductory assessment of ONGC specifies that four Damodar Valley coalfields as Jharia, Bokaro, North Karanpura and Raniganj will be the potential zones. Other important mineral resource mainly found in Asansol-Raniganj area is China clay. Mica is also mined in certain parts of Asansol area.

A good deposit of fire clay and the coarse-grained soft stones which are mandatory and utilized for manufacturing bricks and tiles are abundant in Durgapur sub-division.

Not only is that but also by the benevolence of magnificent river systems, maximum part of the area covered by deposited ordinary river sand. Rock formations of the area are alluvial rocky upland and undulating lateritic upland. These formations undergo series of metamorphic cycles, like weathering, erosion, transportation and deposition of sand material. Sand is a very abundant minor mineral resource of the district. Demand for river sand has enormously increased for infrastructural construction purposes like building construction, road construction and other concretized infrastructural developments. Therefore, in admissible and unscientific mining practices without proper mining plan of river sand from the riverbeds, not only initiate natural & environmental hazards but will also accelerate economic setback of the surrounding areas and need proper initiatives in this regard.

6 Geology

Archaean granite gneisses and migmatites of the Chotanagpur Gneissic Complex are exposed in a narrow east-west belt fringing the north-western part and constitute the oldest basement rocks. Over these, in a faulted, subsided semi-graben type structural trough, deposited the thick bedded sedimentary sequence of Gondwana Super Group comprising sandstone, shale, siltstone with prolific commercial coal seams. All these rocks are cut across by a number of high angle, transverse, gravity faults. Mostly the Lower Gondwana sequence is developed in this district, comprising the Talchir, Barakar, Barren Measure, Raniganj and Panchet Formations. Durgapur beds constitute the youngest unit above the Panchet Formation which is considered equivalent to Mahadeva Formation of Upper Gondwana developed elsewhere. The Gondwana sequence rocks are exposed in the western part of the district area. In parts of the central and in the broad, oval area of eastern part, laterite cover with red soil and Quaternary sequence of riverine sediments grouped under Sijua, Panskura and Diara formations are exposed. The Sijua formation is mainly clay with caliche concretions; Panskura formation constitute clay alternations with silt and sand at the bottom and Diara formation comprise bedded interfingering sand, silt and clay in the present-day shifting river channel courses. Geological succession of Bardhaman district is furnished below.

Table 6.1: Geological succession of Bardhaman (Purba and Paschim)

District Resource Map, Geological Survey of India, 2001
https://www.gsi.gov.in/webcenter/portal/OCBIS/pageMAPS/pageMapsSeries?_adf.ctrl-state=lekbxmwix_5

Lithology	Geologic Unit	Age	
Sand, Silt, Clay	Diara Formation	Quaternary	Upper Holocene to Recent
Clay Alternating with Silt and Sand	Paskura Formation		Middle to Upper Holocene
Clay with Caliche Aoncretion	Sijua Formation		Upper Pleistocene to Middle Holocene
Laterite	Laterite		Cainozoic
Very Coarse Sandstone	Durgapur Bed	Gondwana Super Group	Jurassic
Red Shale, Sandstone	Panchet Formation		Triassic
Fine Grained Sandstone, Siltstone with Coal Seams	Raniganj Formation		Permian
Micaceous Shale, Sandstone	Barren Measure Formation		Permian
Gritty Pebbly Sandstone with Coal Seams	Barakar Formation		Permian
Sandstone, Conglomerate	Talchir Formation		Carboniferous-Permian(?)
Granite Gneiss and Migmatite	Chhotanagpur Granite Gneissic Complex		Achaean(?)-Proterozoic

A District Resource Map of undivided Bardhaman district is furnished below in Figure No. 6.1.

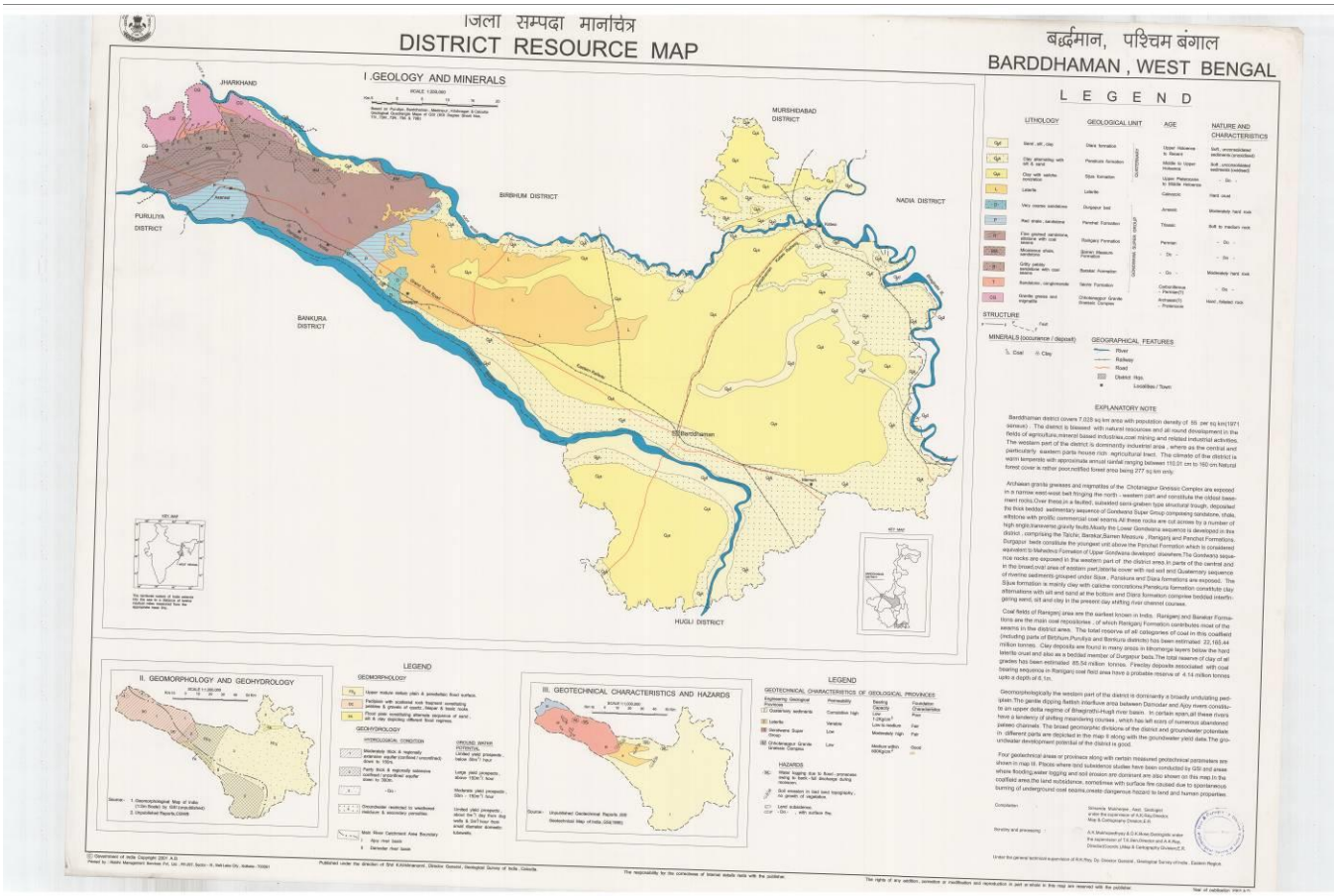


Figure No 6.1: District Resource Map of Paschim Bardhaman and Purba Bardhaman District (*District Resource Map, Geological Survey of India, 2001* *https://www.gsi.gov.in/webcenter/portal/OCBIS/pageMAPS/pageMapsSeries?_adf.ctrl-state=lekbxmwix_5*)

Coal fields of Raniganj area are the earliest known in India. Raniganj and Barakar Formations are the main coal repositories, of which Raniganj Formation contributes most of the seams in the district area. The total reserve of all categories of coal in this coalfield (including parts of Birbhum, Purulia and Bankura districts) has been estimated 22.165.44 million tonnes. Clay deposits are found in many areas in lithomerge layers below the hard laterite crust and also as a bedded member of Durgapur beds. The total reserve of clay of all grades has been estimated 85.54 million tones. Fireclay deposits associated with coal bearing sequence in Raniganj coal field area have a probable reserve of 4.14 million tonnes upto a depth of 6.1m.

PART A: RIVERBED DEPOSITS

7 Mineral wealth

7.1 Overview of mineral resources

The geological formation of Paschim Bardhaman District indicates the presence of quite a number of major minerals and minor minerals.

7.2 Details of Resources

7.2.1 Sand and other riverbed minerals:

I. Drainage System

Drainage system of the district comprises manily of Ajay River. Damodar river is flowing along the southern boundary of the district. A brief description of each river courses is given below.

Damodar River is a river flowing across the Indian states of Jharkhand and West Bengal. Rich in mineral resources, the valley is home to large-scale mining and industrial activity. The Damodar River originates from the Sonajuria falls in the Chhotanagpur Plateau of Bihar. After completion of 368 miles towards the east, it reaches West Bengal and there it joins the Hooghly (Hugli) River. Through the hilly areas, it flows with extensive force and capable of washing away everything that comes on its way.

The basin of river Damodar has a very special shape and this influences its flood pattern. The river has about 70% of its basin just upstream of Durgapur town. This upper catchment of Jharkhand plateau, above Durgapur, generates heavy run-off during high rainfall and is carried to Durgapur in a short time. From here, this discharge travels through the river, bifurcating at Beguahana. One branch, the lower Damodar with very small capacity, reaches the Hoogly on the west bank. The major discharge passes through the Mundeswari to meet the Rupnarayan. Any major discharge along the downstream of Durgapur Barrage may cause flood depending upon the outfall condition of the Mundeswari at Harinkhola. In Kangsabati river system, the Kangsabati Dam has a limited flood storage capacity which is very nominal. *http://wbdmd.gov.in/Pages/Flood2.aspx*. The Chhotanagpur Plateau receives an average annual rainfall of around 1,400 mm, almost all of it in the monsoon months between June and August. The huge volume of water that flows down the Damodar and its tributaries during the monsoons used to be a fury in the upper reaches of the valley. In the lower valley it used to overflow its banks and flood large areas.

Damodar River was earlier known as the "River of Sorrows" as it used to flood many areas of Bardhaman, Hooghly, Howrah and Medinipur districts. Even now the floods sometimes affect the lower Damodar Valley, but the havoc it wreaked in earlier years is now a matter of history. The floods were virtually an annual ritual. In some years the damage was probably more. Many of the great floods of the Damodar are recorded in history — 1770, 1855, 1866, 1873–74, 1875–76, 1884–85, 1891–92, 1897, 1900, 1907, 1913, 1927, 1930, 1935 and 1943. In four of these floods (1770, 1855, 1913 and 1943) most of Bardhaman town was flooded.

It has a number of tributaries and subtributaries, such as Barakar, Konar, Bokaro, Haharo, Jamunia, Ghari, Guaia, Khadia and Bhera. The Damodar and the Barakar trifurcates the Chhotanagpur plateau. The rivers pass through hilly areas with great force, sweeping away whatever lies in their path. *https://www.riversgraphy.com/damodar-river*

The Barakar River is the main tributary of the Damodar River in eastern India. Originating near Padma in Hazaribagh district of Jharkhand it flows for 225 kilometres (140 mi) across the northern part of the Chota Nagpur Plateau, mostly in a west to east direction, before joining the Damodar near Dishergarh in Asansol, Bardhaman district of West Bengal. It has a catchment area of 6,159 square kilometres (2,378 sq mi). The main tributaries, Barsoti and Usri, flow in from the south and north respectively. Apart from the two main tributaries some fifteen medium or small streams join it. *https://en.wikipedia.org/wiki/Barakar_River*

The Ajay River starts the journey from the Chakai block of Jamui (Origin of Ajay River) and then enters Jharkhand state near Devipur. Afterward, at Simuji, it enters West Bengal near Chittaranjan. After entering West Bengal, first, it flows between West Bardhaman district and Jharkhand, and then West Bardhaman district and Birbhum district, and forms the borders between the West Bardhaman district and Jharkhand state, and West Bardhaman district and Birbhum district. Finally, the Ajay River enters Purba Bardhaman district's Katwa subdivision at Nareng village in Ketugram police station and joins Bhagirathi River in Katwa town. The 288 km long (179 miles) river has its 152 km (94 miles) in West Bengal alone. And its catchment area is 2300 square miles or 6000 sq. km. While the Ajay flows through alluvial plains in the Bradhaman district, its upper reaches flow through hilly areas with laterite soil. Previously, one could find dense forests filled with trees like Palas, Piyasal, and Saltreese in the valley of the Ajay River. However, in recent times, the forests are being cleaned due to different activities like mining. *https://www.riversgraphy.com/ajay*

Table 7.1: Drainage system with description of main rivers

Sl.No.	Name of the River	Altitude at Origin	Area drained (Sq. m)	Length in Paschim Bardhaman (km)
1	Ajay River	980 ft	19339646.66	81.54
2	Damodar River	2000.49 ft	118050.38	5.01

Table 7.2: Salient Features of important rivers and streams

S.No.	Name of the River or Stream	Total Length in the District (in Km)	Place of origin	Type
1	Ajay River	81.54	Chakai block of Jamui, Bihar	Non-perennial
2	Damodar River	5.01	Sonajuria falls in the Chota Nagpur Plateau of Bihar	Non-perennial

II. Annual deposition of riverbed minerals

Annual deposition of riverbed minerals is dependent on various factors which are explained below.

A. Geomorphological studies

Geomorphological characteristic of a drainage basin is the foremost factor for annual deposition of sedimentary load. The study includes the following parameters:

i) Place of Origin

The place of origin of each of the five rivers is given in Table 7.3.

Table 7.3: Place of origin of rivers of Paschim Bardhaman district

Name of the River or Stream	Place of origin
Ajay River	Chakai block of Jamui, Bihar
Damodar River	Sonajuria falls in the Chhotanagpur Plateau of Bihar

ii) Catchment Area

River Ajay forming main drainage system of the district along with Damodar River. Ajay River flows from north-west to south-east direction and demarcates the northern boundary of Paschim Bardhaman district. Total Catchment area of Ajay River is about 6,000 sq km. Damodar River flows from north west to south east direction and demarcates the southern boundary of Paschim Bardhaman district. Damodar River basin has a total catchment area of 25,820 sq km.

iii) General profile of river stream

Relative disposition of rivers in Paschim Bardhaman district along with the distribution of the section lines are shown in Figure 7.1. River profile has been studied along the cross section lines (Figures 7.2 and 7.3) which are chosen based on the drastic variation of the river width, proximity of the operating sand ghats and the position of the sand bars.

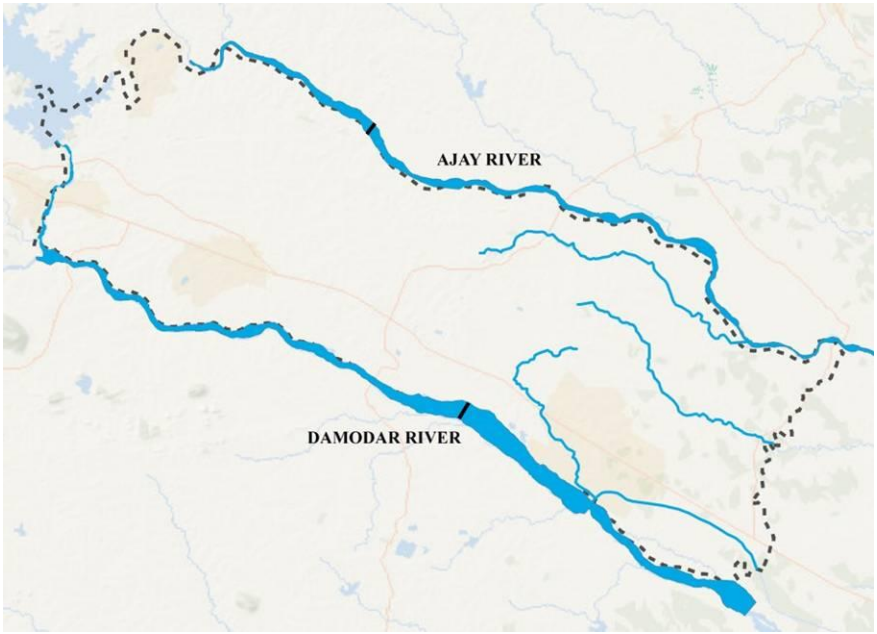


Figure 7.1: Map showing the major rivers along which profile section drawn

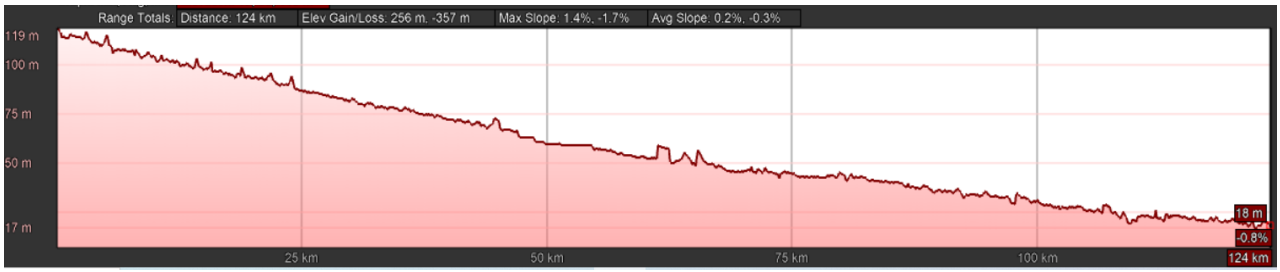


Figure 7.2A: Profile section of Ajay River

Figure 7.2B: Profile section of Damodar River

Figure 7.3A: Cross section view of Damodar River

Figure 7.3B: Cross section view of Ajay River

iv) Annual deposition factor

Annual deposition of riverbed materials depends on various factors, such as process of deposition, mode of sediment transport, sediment transportrate, and sediment yield of the river.

1. Process of deposition

Deposition is the processes where material being transported by a river is deposited. Deposition occurs when the forces responsible for sediment transportation are no longer sufficient to overcome the forces of gravity and friction, creating a resistance to motion; this is known as the null-point hypothesis. This can be when a river enters a shallow area or towards its mouth where it meets another body of water.

The principle underlying the null point theory is due to the gravitational force; finer sediments remain in the water column for longer durations allowing transportation outside the surf zone to deposit under calmer conditions. The gravitational effect or settling velocity determines the location of deposition for finer sediments, whereas a grain's internal angle of friction determines the deposition of larger grains on a shore profile.

Deposition of non-cohesive sediments: Large-grain sediments transported by either bedload or suspended load. In case of bedload, when there is insufficient bed shear stress and fluid turbulence are insufficient to keep the sediment moving, the grain cease horizontal movement and rapidly come to rest. In case of suspended load the grain settle longer distance vertically through the fluid before coming to rest.

Deposition of cohesive sediments: The cohesion of sediment occurs with the small grain sizes associated with silts and clays, or particles smaller than 4Φ or 62.5 μm. If these fine particles remain dispersed in the water column, Stokes law applies to the settling velocity of the individual grains. The face of a clay platelet has a slight negative charge where the edge has a slight positive charge when two platelets come into close proximity with each other the face of one particle and the edge of the other are electrostatically attracted, and then have a higher combined mass which leads to quicker deposition through a higher fall velocity.

2. Mode of sediment transport in rivers

Sediment transport in rivers provides a dynamic linkage between flow and channel form. Mainly there are three processes by which sediment load is transported and these are (i) rolling or traction, in which the particle moves along a sedimentary bed but is too heavy to be lifted from it; (ii) saltation; and (iii) suspension, in which particles remain permanently above the bed, sustained there by the turbulent flow of the water.

Another name for sediment transport is sediment load. The total load includes all particles moving as bedload, suspended load, and wash load.

Bed load: Bedload is the portion of sediment transport that rolls, slides or bounces along the bottom of a waterway. This sediment is not truly suspended, as it sustains intermittent contact with the streambed, and the movement is neither uniform nor continuous. Bedload occurs when the force of the water flow is strong enough to overcome the weight and cohesion of the sediment. While the particles are pushed along, they typically do not move as fast as the water around them, as the flow rate is not great enough to fully suspend them. Bedload transport can occur during low flows (smaller particles) or at high flows (for larger particles). Approximately 5-20% of total sediment transport is bedload. In situations where the flow rate is strong enough, some of the smaller bedload particles can be pushed up into the water column and become suspended.

Suspended load: While there is often overlap, the suspended load and suspended sediment are not the same thing. Suspended sediment are any particles found in the water column, whether the water is flowing or not. The suspended load, on the other hand, is the amount of sediment carried downstream within the water column by the water flow. Suspended loads require moving water, as the water flow creates small upward currents (turbulence) that keep the particles above the bed. The size of the particles that can be carried as suspended load is dependent on the flow rate. Larger particles are more likely to fall through the upward currents to the bottom, unless the flow rate increases, increasing the turbulence at the streambed. In addition, suspended sediment will not necessarily remain suspended if the flow rate slows.

Wash load: The wash load is a subset of the suspended load. This load is comprised of the finest suspended sediment (typically less than 0.00195 mm in diameter). The wash load is differentiated from the suspended load because it will not settle to the bottom of a waterway during a low or no flow period. Instead, these particles remain in permanent suspension as they are small enough to bounce off water molecules and stay afloat. However, during flow periods, the wash load and suspended load are indistinguishable.

3. Sediment Transport Rate

The rate at which sediment is moved past a cross section of the flow is called either the sediment transport rate or the sediment discharge. It's related to the sediment load, but it's different, just because different fractions of the sediment load are transported at different rates. It can be measured in mass per unit time, or in weight per unit time, or in volume per unit time. The sediment transport rate is commonly denoted by Qs.

4. Estimation of Sedimentation

There are two approaches to obtaining values describing sediment loads in streams. One is based on direct measurement of the quantities of interest, and the other on relations developed between hydraulic parameters and sediment transport potential.

The total bed material load is equal to the sum of the bedload and the bed material part of the suspended load; in terms of volume transport per unit width, qt = qb + qs. Here wash load, i.e. that part of the suspended load that is too fine to be contained in measurable quantities in the river bed, is excluded from qs.

There are number of equations to compute the total sediment load. Most of these equations have some theoretical and empirical bases.

In 1973, Ackers and White developed a general theory for sediment transport which was calibrated against the flume-transport data then available. Their functions have been widely accepted as one of the best available procedures for estimating the total bed over the full width of the flow section.

Dendy-Bolton formula is often used to calculate the sedimentation yield. But use of these equations to predict sediment yield for a specific location would be unwise because of the wide variability caused by local factors not considered in the equations development. However, they may provide a quick, rough approximation of mean sediment yields on a regional basis. Computed sediment yields normally would be low for highly erosive areas and high for well stabilized drainage basins with high plant density because the equations are derived from average values. The equations express the general relationships between sediment yield, runoff, and drainage area.

5. Sediment Yield

The water that reaches a stream and its tributaries carries sediment eroded from the entire area drained by it. The total amount of erosional debris exported from such a drainage basin is its sediment load or sediment discharge and the sediment yield is the sediment discharge divided by the total drainage area of the river upstream of the cross section at which the sediment discharge is measured or estimated. Sediment yield is generally expressed as a volume or weight per unit

area of drainage basin—e.g., as tons per square kilometre. Further, sediment yield is usually measured during a period of years, and the results are thus expressed as an annual average.

v) Replenishment Study as per EMGSM guidelines 2020:

Replenishment study for a river solely depends on estimation of sediment load for any river system and the estimation is a time consuming and should be done over a period. The process in general is very slow and hardly measurable on season to season basis except otherwise the effect of flood is induced which is again a cyclic phenomenon. Usually, replenishment or sediment deposition quantities can be estimated in the following ways as given below:

A. Replenishment study based on satellite imagery involves demarcation of sand bars potential for riverbed mining. Both pre and post monsoon images need to be analysed to established potential sand bars. Volume estimation of sand is done by multiplying Depth and Area of the sand bar. The sand bars are interpreted with the help of satellite imagery. Ground truthing has been done for 100% of the total identified sand bars. During ground truthing, width and length of each segment were physically measured. It has also been observed that in few cases, sand bars have attained more than 3 meters height from the average top level of the river beds. Considerations of sand resources have been restricted within 3 meters from the average top surface of the river bed.
B. Direct field measurement of the existing leases involving estimation of the volume diference of sand during pre- and post-monsoon periods. With systematic data acquisition, a model has been developed for calculation of sediment yield and annual replenishment with variable components.
C. The replenishment estimation based on a theoretical empirical formula with the estimation of bed-load transport comprising of analytical models to calculate the replenishment estimation.

V(A). Replenishment study based on field investigation:

Sedimentation in any river is dependent on sediment yield which depends on soil erosion in river's catchment area. Catchment yield is computed using Strange's Monsoon runoff tables for runoff coefficient against rainfall return period. Peak flood discharge is calculated by using Dickens, Jarvis and Rational formula at 25, 50 and 100 years return period. The estimation of bed load transport using Ackers and White Equation.

Methodology Adopted: To delineate replenishment percentage in the river bed of the district, below mentioned steps have been followed.

1. Field data collation

Field data collation was carried out during May- June 2020 for pre-monsoon period and October- November 2020 for all the river ghats for post monsoon period. However, the nonoperational areas were covered through traverses. In both the cases, relative elevation levels were captured through GPS/DGPS/ Electronic Total Station. Thickness of the sand bars was measured through sectional profiles. In few instances, sieve analysis of the sands was carried out to to assess their particle size distribution.

Figure 7.4: Site View of River Ajay (March, 2020)

2. Selection of study profiles:

Study profiles are selected based on the occurrence of the sand bars in the channel profiles. Aerial extents of each of the profiles are mapped from satellite imagery.

3. Data compilation:

Following data were compiled for generation of the annual replenishment report:

- Elevation levels of the different sand ghats and sand bars as measured at site.
- Extents of the sand bars are measured from the pre-monsoon satellite imagery.
- Sand production data of the district.

All these data were compiled while estimation of the replenished sand in the Paschim Bardhaman district.

4. Assessment of sediment load in the river:

Assessment of sediment load in a river is subjective to study of the whole catchment area, weathering index of the various rock types which acts as a source of sediments in the specific river bed, rainfall data over a period not less than 20 years, and finally the detail monitoring of the river bed upliftment with time axis. Again, the sediment load estimation is not a dependent variable of the district boundary, but it largely depends upon the aerial extents of the catchment areas, which crossed the district and state boundaries.

The major sand producing rivers of the Paschim Bardhaman district is Ajay River. Damodar River flowing along the southern boundary but does not forming major potential zone for sand mining. Planning has been done for systematic sand mining in the river of Ajay.

While calculation of the areas of sand bar, a classification system has been adopted with three categories of land identified within the channel areas which is as follows:

a. The untapped sand bars.
b. The sand bars worked in the pre-monsoon period.
c. Main channel course within the channel.

A summary of sediment load comparison between pre- and post-monsoon period for different rivers of Paschim Bardhaman district is given in Table 7.4 and details of each sand bars along with their sand resources in pre-monsoon and post monsoon periods are provided in Annexure 2. Maps showing distribution of sand bars on rivers of the Paschim Bardhaman district during pre- and post-monsoon are depicted in Plate 2A and Plate 2B respectively.

Table 7.4: Sediment load comparison between Pre and Post Monsoon period for different rivers of Paschim Bardhaman district

River Name	Pre-Monsoon no of ghats	Post-Monsoon no of ghats	Pre-Monsoon Sediment Load (MCum)	Post Monsoon Sediment Load (MCum)	Variance (MCum)	Variance (%)
Ajay	42	40	21.76	26.74	7.14	**33**
Damodar	1	1	5.13	5.71	0.57	11
Total =	43	41	26.90	34.61	7.71	29

Thus, in Paschim Bardhaman district, about 7.71 million cum of sand has been found as an incremental volume when compared between pre and post monsoon sand reserve data. The average replenishment and aggradation rate for the year comes to about 129%.

Long-term satellite imagery study has also been carried out for sand producing rivers of Paschim Bardhaman district to analyse the changes in river course. A representative map, showing long-term (from 1985-2010-to 2022) erosion-accretion areas on both the banks of Ajay

River has been prepared and furnished as Plate No. 5. The map shows changes in river channel cross-section through erosion and accretion of river bank. River channel is showing widening of river channel as compare between 1985 and 2022.

V(B). Replenishment estimation based on field investigation

The study was carried out on existing mining leases. In order to assess the annual replenishment rate, an approach of direct measurement methodology has been adopted. The depth and area of the mining leases are measured through DGPS/Total station just before the closure of the mines in pre-monsoon period and the same areas are resurveyed in the post-monsoon period. The difference between the depth of the surveyed areas are accounted for the volumetric measurement of the replenished sand.

Table 7.5 represents field measurement of replenishment rate estimated for major rivers.

Table 7.5: Replenishment rate of the district

River Name	Location	Area	Surface RL	Thickness	Volume	After mining floor RL	Surface RL after Replenishment	Thickness Replenished	Volume Replenished	Difference in RL	Replenishment Rate
		m2	m	m	cum	m	m	m	cum	m	%
Ajay	Barabani	34400.00	109.00	2.95	101480.00	106.05	108.95	2.90	99653.36	0.05	98.20%
Ajay	Jamuria	23700.00	84.00	2.90	68730.00	81.10	83.94	2.84	67355.40	0.06	98.00%
Ajay	Pandaveswar	21100.00	64.00	3.00	63300.00	61.00	63.93	2.93	61780.80	0.07	97.60%
Ajay	Kanksha	28600.00	55.00	2.87	82082.00	52.13	54.93	2.80	79947.87	0.07	97.40%
Damodar	Andal	46900.00	69.00	2.90	136010.00	66.10	68.96	2.86	133969.85	0.04	98.50%

The average replenishment rate for the year 2020 is about 98.10%.

V(C). Replenishment estimation based on an empirical formula:

The river reaches with sand provide the resource and thus it is necessary to ascertain the rate of replenishment of the mineral. Regular replenishment study needs to be carried out to keep a balance between deposition and extraction.

Sediment load deposition in a river is dependent on catchment area, weathering index of the various rock types of the catchment area, land-use pattern of the area, rainfall data and grain size distribution of the sediments. Again, the sediment load estimation is not a dependent variable of the district boundary, but it largely depends upon the aerial extents of the catchment areas, which crosses the district and state boundaries.

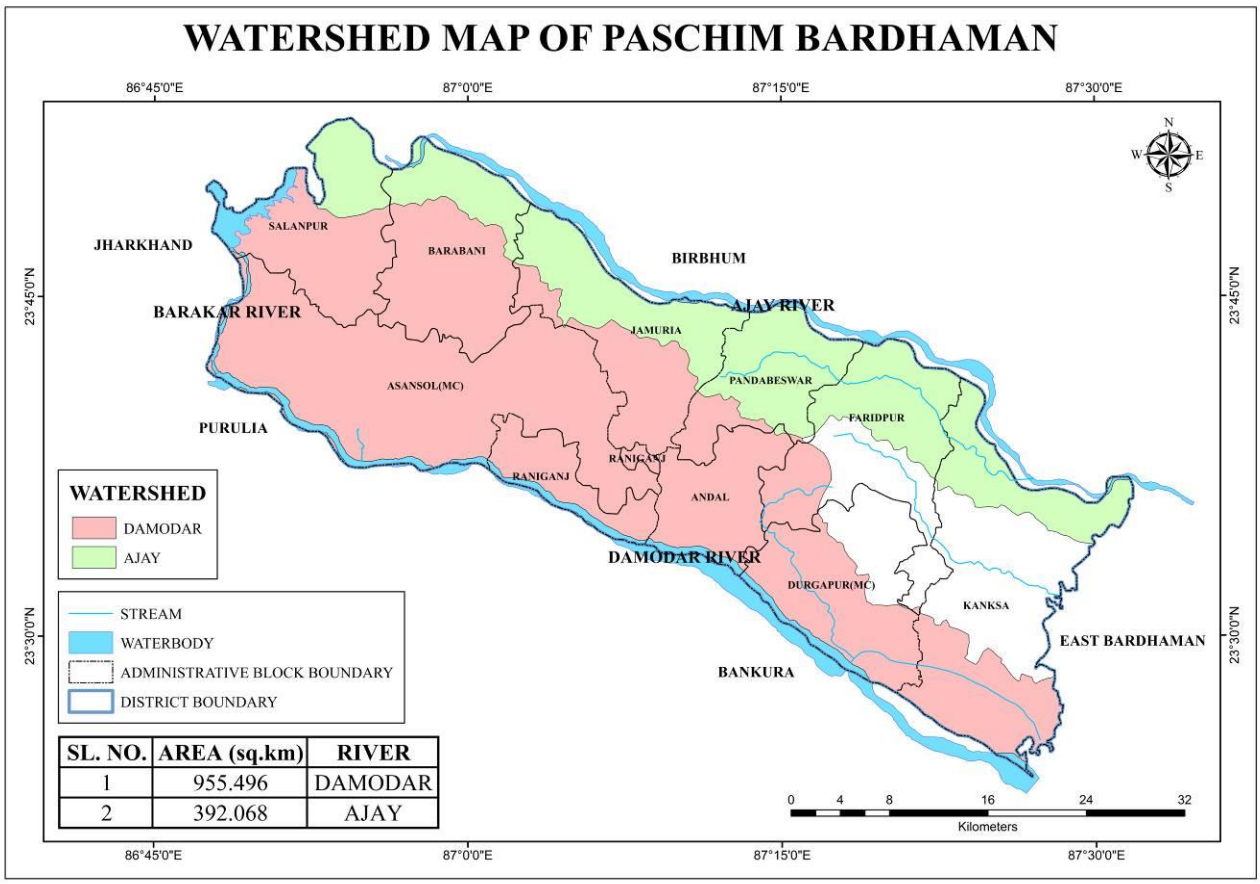
i. Methodology of the study:

The replenishment estimation is based on a theoretical empirical formula with the estimation of bedload transport comprising of analytical models to calculate the replenishment

estimation. Sedimentation in riverbed depends on catchment yield, peak flood discharge due to rainfall, bed load transport rates and sediment yield characteristic of the river. Some of the common methods used for replenishment study are explained below.

a. Catchment yield calculation:

The total quantity of surface water that can be expected in a given period from a stream at the outlet of its catchment is known as yield of the catchment in that period. The annual yield from a catchment is the end product of various processes such as precipitation, infiltration and evapotranspiration operating on the catchment.



SL. NO.	AREA (sq.km)	RIVER
1	955.496	DAMODAR
2	392.068	AJAY

Figure 7.5: Watershed map of Paschim Bardhaman district

Catchment yield can be estimated using following formula:

Catchment yield (m^3) =Catchment area (m^2) × Runoff coefficient (%) × Rainfall (m)

The runoff generated from the watershed is analyzed using Strange's Tables to get the reliable yield results. Runoff from a catchment is dependent upon annual rainfall as well as catchment characteristics such as soil types and the type of groundcover / land usage. Remote sensing was used for demarcation of catchment area relevant to the drainage system. Runoff coefficient of the catchment has been established based on Stange's Table.

Strange (1892) studied the available rainfall and runoff and obtained yield ratios as functions of indicators representing catchment characleris1ics (Subramanya, 2008). Catchments are classified as good, average and bad according to the relative magnitudes of yield of sediment. For example, catchment with good forest cover and having soils of high permeability would be classified as bad, while catchment having soils of low permeability and having little or no vegetal cover is termed good. Based on the study Stange established runoff coefficient table as given in Table 7.6.

Table 7.6: Runoff coefficient of the catchment based on Strange's table

Total monsoon rainfall (mm)	Runoff coefficient (%)			Total monsoon rainfall (mm)	Runoff coefficient (%)		
	Good catchment	Average catchment	Bad catchment		Good catchment	Average catchment	Bad catchment
25.4	0.1	0.1	0.1	787.4	27.4	20.5	13.7
50.8	0.2	0.2	0.1	812.8	28.5	21.3	14.2
76.2	0.4	0.3	0.2	838.2	29.6	22.2	14.8
101.6	0.7	0.5	0.3	863.6	30.8	23.1	15.4
127	1	0.7	0.5	889	31.9	23.9	15.9
152.4	1.5	1.1	0.7	914.4	33	24.7	16.5
177.8	2.1	1.5	1	939.8	34.1	25.5	17
203.2	2.8	2.1	1.4	965.2	35.3	26.4	17.6
228.6	3.5	2.6	1.7	990.6	36.4	27.3	18.2
254	4.3	3.2	2.1	1016	37.5	28.1	18.7
279.4	5.2	3.9	2.6	1041.4	38.6	28.9	19.3
304.8	6.2	4.6	3.1	1066.8	39.8	29.8	19.9
330.2	7.2	5.4	3.6	1092.2	40.9	30.6	20.4
355.6	8.3	6.2	4.1	1117.6	42	31.5	21
381	9.4	7	4.7	1143	43.1	32.3	21.5
406.4	10.5	7.8	5.2	1168.4	44.3	33.2	22.1
431.8	11.6	8.7	5.8	1193.8	45.4	34	22.7
457.2	12.8	9.6	6.4	1219.2	46.5	34.8	23.2
482.6	13.9	10.4	6.9	1244.6	47.6	35.7	23.8
508	15	11.3	7.5	1270	48.8	36.6	24.4
533.4	16.1	12	8	1295.4	49.9	37.4	24.9
558.8	17.3	12.9	8.6	1320.8	51	38.2	25.5
584.2	18.4	13.8	9.2	1346.2	52.1	39	26
609.6	19.5	14.6	9.7	1371.6	53.3	39.9	26.6
635	20.6	15.4	10.3	1397	54.4	40.8	27.2
660.4	21.8	16.3	10.9	1422.4	55.5	41.6	27.7
685.8	22.9	17.1	11.4	1447.8	56.6	42.4	28.3
711.2	24	18	12	1473.2	57.8	43.3	28.9
736.6	25.1	18.8	12.5	1498.6	58.9	44.4	29.4
762	26.3	19.7	13.1	1524	60	45	30

(Subramanya, 2008)

Rainfall return period for 25, 50 and 100 years calculated as below:

As per Weibull's Formula (Subramanya, 2008)**,**

Return period/Recurrence interval = (n+1)/m

Where: n number of years on record;
m is the rank of observed occurrences when arranged in descending order.

b. Peak Flood Discharge Calculation:

The term "peak discharge" stands for the highest concentration of runoff from the basin area. The accurate estimation of flood discharge remains one of the major challenges as it depends upon physical characteristic of the catchment area and the flood intensity, duration and distribution pattern. There have been many different approaches for determining the peak runoff from an area. As a result, many different models (equations) for peak discharge estimation have been developed. Formulas used for Peak Discharge calculation areas below:

As per Dicken's formula (Subramanya, 2008)**,**

$$Q = CA^{3/4}$$

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km
C is Constant whose value varies widely between 2.8 to 5.6 for catchments in plains and 14 to 28 for catchments in hills

As per Jarvis formula (Subramanya, 2008)**,**

$$Q = CA^{1/2}$$

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km
C is Constant whose value varies between 1.77 as minimum and 177 as maximum. Limiting or 100 percent chance floods are given by the value of C of 177

As per Rational formula (Subramanya, 2008)**,**

$$Q = CIA$$

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km
C is Runoff coefficient which depends on the characteristics of the catchment area. It is a ratio of runoff: rainfall
I is Intensity of rainfall (in m/sec)

c. Bed Load Transport Calculation:

The most important problems in river engineering are to predict bed load transport rates in torrential floods flowing from mountainous streams. Three modes of transport namely; rolling, sliding and saltation may occur simultaneously in bed load transport. The different modes of transportation are closely related and it is difficult, if not impossible, to separate them completely. There are number of equations to compute the total sediment load. Most of these equations have some theoretical and empirical bases.

Ackers and White Equation:

Ackers and White (1973) used dimensional analysis based on flow power concept and their proposed formula is as follows.

$$C_t = C_s G_s \, (d_{50}/h) \, (V/U_*)^{n'} \, [(F_{gr}/A_1) - 1]^{m}$$

The dimensionless particle d_{gr} is calculated by:

$$d_{gr} = d_{50} \, (g(G_s-1)/v^2)^{1/3}$$

The particle mobility factor $F_{gr}$is calculated by:

$$F_{gr} = (U \times n'/(Gs-1) g \, d_{50})^{1/2} \times (V/(5.66 \log(10h/d_{50}))^{1-n'}$$

Where,

A_1 = Critical particle mobility factor
C_s = Concentration coefficient in the sediment transport function
C_t = Total sediment concentration
d_{50} = Median grainsize
d_{gr} = Dimensionless particle diameter
F_{gr} = Particle mobility parameter
g = Acceleration of gravity
D_s, S_g = Specific gravity
h = Water depth
m = Exponent in the sediment transport function
n' = Manning roughness coefficient
U_* = Shear velocity
V = Mean flow velocity
ν = Kinematic viscosity

Meyer – Peter's equation:

Meyer-Peter's equation (Ponce, 1989) is based on experimental work carried out at Federal Institute of Technology, Zurich. Mayer-Peter gave a dimensionless equation based on rational laws. Mayer- Peter equations gave an empirical formula of bed load transport rates in flumes and natural rivers. The simplified Meyer-Peter's equation is given below:

$$g_b = 0.417[\tau_0 \, (\eta'/\eta)^{1.5} - \tau_c]^{1.5}$$

Where,
gb = Rate of bed load transport (by weight) in N per m width of channel per second.

η' = Manning's coefficient pertaining to grain size on an unrippled bed and Strickler formula i.e. η' = (1/24) x d1/6 where d is the median size (d_{50}) of the bed sediment in m.

η = The actual observed value of the rugosity coefficient on rippled channels. Its value is generally taken as 0.020 for discharges of more than 11cumecs, and 0.0225 for lower discharges.

τc = Critical shear stress required to move the grain in N/m2 and given by equationτc = 0.687da, where da is mean or average size of the sediment in mm. This arithmetic average size is usually found to vary between d_{50} and d_{60}.

τ0= Unit tractive force produced by flowing water i.e. γwRS. Truly speaking, its value should be taken as the unit tractive force produced by the flowing water on bed = 0.97γwRS. R is the hydraulic mean depth of the channel (depth of flow for wider channel) and S is the bed slope.

d. Sediment Yield Estimation:

Sedimentation occurred as the velocity decreases along with its ability to carry sediment. Coarse sediments deposit first, then interfere with the channel conveyance, and may cause additional river meanders and distributaries. The area of the flowing water expands, the depth decreases, the velocity is reduced, and eventually even fine sediments begin to deposit. As a result, deltas may be formed in the upper portion of reservoirs. The deposited material may later be moved to deeper portions of the reservoir by hyraulic processes within the water body.

There are many sediment transport equations which are suitable for use in the prediction of the rate of replenishment of river. Some of the famous sediment equations are:

1. Dendy – Bolton Equation
2. Yang Equations
3. Engelund-Hansen Equation
4. Modified Universal Soil Loss Equation (MUSLE) developed by Williams and Berndt (1977)

Dendy–Bolton Equation:

Dendy–Bolton formula (Dendy and Bolton 1976) is often used to calculate the sedimentation yield because:-

- The formula uses catchment area and mean annual runoff as key determinants.
- It does not differentiate in basin wide smaller streams and their characteristics.
- Dendy and Bolton equation calculates all types of sediment yield i.e. sheet and rill erosion sediments, gully rosion sediments, channel bed and bank erosion sediments and mass movement etc.

Dendy-Bolton determined the combined influence of runoff and drainage area on sediment yield to compute the sediment yield. They developed two equations i.e. for run off less than 2 inch and for run off more than 2 inch, which are given below:

For run off less than 2 inch:

$$(Q<2in)\ S=1289\times (Q)^{0.46}\times [1.43-0.26\ \mathrm{Log}\ (A)]$$

For run off more than 2 inches:

(Q > 2 in): $S = 1958 \times (e^{-0.055 \times Q}) \times [1.43-0.26 \text{ Log } (A)]$
Where: S = Sediment yield (tons/sq miles/yr)

Q = Mean Annual runoff (inch)

A = Net drainage are in sq mile

Dendy Bolton formula is often used to calculate the sedimentation yield. But use of these equations to predict sediment yield for a specific location would be unwise because of the wide variability caused by local factors not considered in the equations development. However, they may provide a quick, rough approximation of mean sediment yields ona regional basis for preliminary watershed planning. Computed sediment yields normally would be low for highly erosive areas and high for well stabilized drainage basins with high vegetation density because the equations are derived from average values. The equations express the general relationships between sediment yield, runoff, and drainage area. Many variables influence sediment yield from a drainage basin. They include climate, drainage area, soils, geology, topography, vegetation and land use. The effect of any of these variables may vary greatly from one geographic location to another, and the relative importance of controlling factors often varies within a given land resource area. Studies revealed that sediment yield per unit area generally decreases as drainage area increases. As drainage area increases, average land slopes usually decrease; andthere is less probability of an intense rainstorm over the entire basin. Both phenomena tendto decrease sediment yield per unit area.

Modified Universal Soil Loss Equation (MUSLE):

Modified universal soil loss equation (MUSLE) for estimation of sediment yield is also widely used (Wischmeier and Smith, 1978). MUSLE is a modification of the Universal Soil Loss Equation (USLE). USLE is an estimate of sheet and rill soil movement down a uniform slope using rain- fall energy as the erosive force acting on the soil (Wischmeier and Smith 1978). Depending on soil characteristics (texture, structure, organic matter, and permeability), some soils erode easily while others are inherently more resistant to the erosive action of rain- fall.

MUSLE is similar to USLE except for the energy component. USLE depends strictly upon rainfall as the source of erosive energy. MUSLE uses storm-based runoff volumes and runoff peak flows to simulate erosion and sediment yield (Williams 1995). The use of runoff variables rather than rainfall erosivity as the driving force enables MUSLE to estimate sediment yields for individual storm events. The generalized formula of MUSLE is as below:

$$\mathbf{Y=11.8 \times (Q \times qP).56 \times K \times Ls \times C \times P}$$

Where,
Y = sediment yield of stream (t/yr/km2),
Q = average annual runoff (m3),
K = soil erodibility factor,
qP = Highest discharge recorded (m3/s),
Ls = gradient/slope length,

C = cover management factor,
P = erosion control practice

ii. Estimation of Replenishment:

The major sand producing rivers of the Paschim Bardhaman district are Damodar, Ajay and Barakar rivers. These rivers and its tributary rivers are forming the main catchment area.

For replenishment study, following assumption/calculation are taken in to consideration:

- Catchment area (Watershed area) against each river has been calculated based on remote sensing data.
- Rainfall runoff coefficient as per Strange's table for the catchment area is consider 45%, as the rainfall in the district is more than 1524mm and the characteristic of the catchment of the district is average in nature.
- Peak flood discharge of the river of the district calculated based on Dicken's formula which is more applicable to north Indian and central Indian catchment. Here Dicken constant C is taken as 12 in present study as per published literature by Saha (2002).
- Bed load transport has not been computed in the regional aspect of the district, as the values are highly dependent on local factors such as particle mobility factor, roughness coefficient, Shear velocity, Mean flow velocity, Kinematic viscosity etc.
- Sedimentation yield calculated as per Dendy and Bolton formula as the equations express the general relationships between sediment yield, runoff, and drainage area.
- Computed sediment yields by Dendy and Bolton formula normally would be low for highly erosive areas and high for well stabilized drainage basins with high plant density because the equations are derived from average values.
- Dendy and Boltan formula also says that actual sediments yield from individual drainage basins may vary 10-fold or even 100-fold from computed yields. Since the district river basin comprises of sedimentary rocks with good average rainfall therefore the estimated replenishment considered as 50-fold of computed results sediment yield.

The data estimated for each river in the district are given in Table 7.7.

Table 7.7: Replenishment parameter estimated for each river in the district

Estimation parameter	Ajay	Damodar
Catchment Area (m^2)	398110000	1027720000
Annual Rainfall (m) (in 2020)	1.48	1.48
Strange Runoff coefficient (%)	43%	43%
Annual Run-off (m) (in 2020)	0.3256	0.3256
Catchment Yield (m^3)	255124812.4	658604085
Peak Flood Discharge (m^3/sec)	33820775.45	68879082.30
Flow depth d (m)	1.2	1.6
Channel width b (m)	240	655

Estimation parameter	Ajay	Damodar
Mean velocity v (m/s)	0.05	0.06
Channel slope S_0 (m/m)	0.001	0.001
Sediment Yield (Tons/year)	9584.28	21666.01
Estimated Annual Replenishment (in million m3)	0.25222	0.57016

Specific gravity of sand = 2.76 tonne per m³

Sedimentation rate of a river is dependent on the annual rainfall of the district. Sedimentation rate for the period 2016-2020 of each river is presented in Table 7.8 and Figure 7.6.

Table 7.8: Sedimentation rate for the period 2016-2020 of each river

Year	Damodar	Ajay	Annual Rainfall
2016	24.61	28.1	1408.4
2017	14.03	16.02	1668
2018	59.48	67.92	1000.8
2019	37.55	42.88	1213.2
2020	21.08	24.07	1479.8

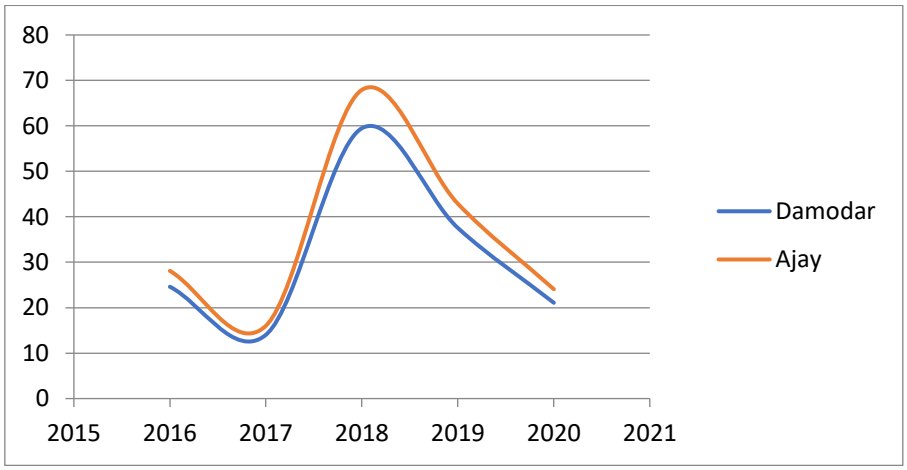


Figure 7.6: Graphical representation of year-wise sedimentation rate

The estimation of sedimentation rate based on empirical formula need critical analysis of different factors related to the LULC property of the catchment area, slope geometry, sediment erosion factor of catchment litho-type. This will help to assess replenishment rate more precisely.

Replenishment studies based on empirical formula for existing mining leases have also been conducted and are given in Table 7.9.

Table 7.9: River wise replenishment rate estimation based on empirical formula

River Name	Location	Lease Area	Surface RL Before mining	Mine out Thickness	Mine out Volume	Annual Rainfall-2020	Estimated Replenished Volume as per Dandy- Bolton	Replenishment Rate
		m2	m	m	cum	m	cum	%
Ajay	Barabani	34400.00	109.00	2.95	101480.00	1.48	75095.20	74.00%
Ajay	Jamuria	23700.00	84.00	2.90	68730.00		51410.04	74.80%
Ajay	Pandaveswar	21100.00	64.00	3.00	63300.00		47601.60	75.20%
Ajay	Kanksha	28600.00	55.00	2.87	82082.00		62382.32	76.00%
Damodar	Andal	46900.00	69.00	2.90	136010.00		105407.75	77.50%

Illustration of Replenishment Estimation is given in Table 7.10.

Table 7.10: Illustration of replenishment rate calculation based on 3 methods

Based on Satellite imageries		Based on field investigation		Based on empirical formula	
Particulars	Estimation	Particulars	Estimation	Particulars	Estimation
River	Ajay	River Name	Ajay	River Name	Ajay
Total Premonsoon Sand Bar Area	8076686 (sq.m)	Mining Area	23700 (Sq.m)	Lease Area	23700 (Sq.m)
Average Pre monsoon Thickness	2.8 (m)	Pre-monsoon RL	84 (m)	Surface RL Before mining	84 (m)
Total Volume	21.68 (Mcum)	Sand Thickness	2.90 (m)	Mine out Thickness	2.90 (m)
Total Postmonsoon Sand Bar Area	7633278 (sq.m)	Volume excavated (Cum)	68730.00 (Cum)	Mine out Volume (Cum)	68730 (Cum)
Average Postmonsoon Thickness	2.9 (m)	Post monsoon RL	83.94 (m)	Drainage area for lease block	0.049 (Sq.km)
Total Volume	22.73 (M.cum)	Thickness	2.84 (m)	Monsoon Rainfall-2020	1.48 (m)
Total Pre and Post monsoon Volume Difference	1.04 (M.cum)	Volume deposited (Cum)	67335.40 (Cum)	Estimated Volume as per Dendy- Bolton	51410.04 (Cum)
Replenishment and Agrredation %	105%	Replenishment Rate	98.00%	Replenishment Rate	74.80%

Table 7.11: Comparison of replenishment study

Replenishment Study Method	Damodar	Ajay
Estimated Annual Replenishment based on Sattelite imegaries **(*)**	111%	133%
Estimated Annual Replenishment based on field investigation	98.50%	97.80%
Estimated Annual Replenishment based on empirical formula	77.50%	75.00%

(*)Replenishment study based on satellite imagery involves estimation of replenish volume along with aggredation volume.

vi) Total potential of minor mineral in the riverbed

The major sand producing rivers of the Paschim Bardhaman district are Ajay and Damodar rivers. Planning has been done for systematic sand mining in the rivers.

B. Geological studies

i) Lithology of the catchment area

Archaean granite gneisses and migmatites of the Chotanagpur Gneissic Complex are exposed in a narrow east-west belt fringing the north-western part and constitute the oldest basement rocks. Over these, in a faulted, subsided semi-graben type structural trough, deposited the thick bedded sedimentary sequence of Gondwana Super Group comprising sandstone, shale, siltstone with prolific commercial coal seams. All these rocks are cut across by a number of high angle, transverse, gravity faults. Mostly the Lower Gondwana sequence is developed in this district, comprising the Talchir, Barakar, Barren Measure, Raniganj and Panchet Formations. Durgapur beds constitute the youngest unit above the Panchet Formation which is considered equivalent to Mahadeva Formation of Upper Gondwana developed elsewhere. The Gondwana sequence rocks are exposed in the western part of the district area. In parts of the central and in the broad, oval area of eastern part, laterite cover with red soil and Quaternary sequence of riverine sediments grouped under Sijua, Panskura and Diara formations are exposed. The Sijua formation is mainly clay with caliche concretions; Panskura formation constitute clay alternations with silt and sand at the bottom and Diara formation comprise bedded interfingering sand, silt and clay in the present-day shifting river channel courses. Geological succession of Bardhaman district is furnished below.

ii) Tectonics and structural behavior of rocks

Paschim Bardhaman district is a sort of an extension of the Chota Nagpur Plateau. It is a transitional zone between the Chota Nagpur Plateau, which constitutes a portion of peninsular shield in the west, and Ganga-Brahamaputra alluvial plain in the north and east. The rocky undulating topography with laterite soil is found in the western part of the district, which extends to the western part of Durgapur subdivision; barren, rocky and rolling laterite soil rising into rocky hillocks, the highest being 227 m. The eastern part of the district gradually slopes down to the rice plains of Bengal. The district is a part of the Ajay Damodar Barakar tract with the Ajay on the north, the Damodar on the south and the Barakar on the west. The Ajoy-Damodar inter-stream tract is made up of several myriads of minor rivers and streams which criss-cross the district. This diversifies the landscape and lends a special charm to the area around Asansol and Durgapur subdivision.

C. Climate Factors

i) Intensity of rainfall

The average annual rainfall of the area is about 1044 mm. Rainfall during the monsoon period (June to September) constitutes 75 % of the annual rainfall. The driest month is December, with 2 mm or 0.1 inch of rain. The greatest amount of precipitation occurs in July, with an average

of 309 mm or 12.2 inch. On an average the district has 70 rainy days in a year. The most prominent special weather phenomena of the district are the Nor'westers or Kalbaisakhis. Most of them strike with speed of 65 to 100 km/hr with rainfall ranging from 10 mm to 50 mm and marked by a consequent fall of temperature.

ii) Climate zone

Paschim Bardhaman district has a tropical climate - hot and humid. While the hottest month is May, the coldest is January. The monsoon season is from June to September with an annual average rainfall of 1,044 mm. Localised thunderstorms, called "Kalbaisakhi" in Bengali, are a special feature from March until the monsoon sets in. In monsoon period from June to September, wind blows from the south-west direction recognized as south-west monsoon. During winter, i.e., from December to February winds are mainly northerly or north-easterly with clear or patchily clouded sky. Temperatures are fairly cool between winter and spring.

iii) Temperature variation

Paschim Bardhaman district experiences dry and hot summer with maximum temperature of near about≈ 40°C during summer. The district shows a fierce dry heat in the warmer months. The summers in Paschim Bardhaman usually start from month of March and last till the middle of June. The arrival of the month of June marks the onset of monsoon in Paschim Bardhaman. The district receives a high average rainfall. June to September has shown maximum average rainfall with moderate temperature. Winters in Paschim Bardhaman are pleasant and enjoyable, with mercury dropping to about 14°C or below. The winter starts from December and last till the month of February. Due to such favourable conditions, winter is deemed as the best time for the tourists to visit Paschim Bardhaman.

For the purpose of estimating mineable mineral potential, the thickness of the sand bar considered extractable based on base flow level is given in Table 7.11.

Table 7.12: River wise Thickness of sand bar considered mineable

River Name	Considered Mining Thickness (m)
Ajay	3
Damodar	3

Based on geomorphology, geology, climate and mineable thickness of sand bar the annual deposition of riverbed minerals (sand and gravel) has been estimated.

Sand bar area recommended for mineral concession in the table is calculated as per the Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) 2020. As per guidelines, mining depth restricted to 3 meters depth and distance from the bank is ¼th of river width and

not less than 7.5 meters. Also, mining is prohibitated up to a distance of 1 kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side. The annual minable mineral potential is given in Table 7.12.

Table 7.13: Annual mineable mineral potential

Sl. No.	River or Stream	Portion of the river stream recommended for mineral concession (%)	Length of area recommended for mineral concession (in meter)	Average width of area recommended for mineral concession (in meters)	Area recommended for mineral concession (in Sqm)	Mineable mineral potential (in Mcum) (60% of total mineral potential
1	Ajay	3	53,154.34	651.67	78,79,461.52	14.18
2	Damodar	3	4,000.00	1,500	1407552.481	2.53
Total Mineable volume						16.72

III. Riverbed Mineral Potential

Sand is the important riverbed mineral found to be potential for mining. Considerable quantity of quality sands is found to occur in part of Damodar, Ajay and Barakar Rivers. Table 7.13 summarizes the potential riverbed mineral deposits of the district. Smaller patches are also available locally in the other smaller rivers as well. Sand mining can be developed on cluster approach with restricted usage of Machinery's for lifting of sands. The rivers in the north Bengal are filled by Gravels and boulders. Development of river bed material with huge boulders also requires usage of machinery's to increase more production in turn revenue.

Table 7.14: Resources of Potential Riverbed Mineral

Boulder (Mcum)	Pebbles/ Gravel (Mcum)	Sand/White sand (Mcum)	Total Mineable, Mineral Potential (Mcum)
0	0	16.72	16.72

Based on satellite imagery study and field investigation, potential zones for riverbed deposits for each river of the district have been identified and the details of the zones are provided in Table 7.14.

Table 7.15: Potential Zone of Riverbed Mineral

RIVER NAME	BLOCK NAME	MOUZA NAME	ZONE	COORDINATE		LENGTH (MTS)	WIDTH (MTS)	AREA (SQMTS)
				LATITUDE	LONGITUDE			
AJAY	SALANPUR, BARABANI	Jitpur, Phulberia	ZONE_1	23° 51' 43.151" N 23° 51' 25.074" N	86° 55' 54.390" E 86° 59' 37.325" E	9349.61	640	468255.03
	PANDABESWAR, BARABANI, JAMURIA	Putulia, Amulia, Baguli. Desher Mohan, Barjadihi, Shyamla, Barjore	ZONE_2	23° 51' 0.480" N 23° 44' 27.187" N	87° 0' 43.292" E 87° 16' 17.558" E	30819.8	1500	6287338.88
	PANDABESWAR, FARIDPUR	Parulbona, Chapla	ZONE_3	23° 43' 17.835" N 23° 43' 1.967" N	87° 18' 48.539" E 87° 21' 22.597" E	4739.44	510	461242.8
	KANKSA	Talbahari	ZONE_4	23° 41' 33.400" N 23° 39' 38.185" N	87° 24' 3.463" E 87° 24' 32.814" E	4273.93	520	397183.47
	KANKSA	Santoshpur	ZONE_5	23° 36' 43.018" N 23° 36' 46.393" N	87° 26' 58.589" E 87° 28' 17.326" E	2257.49	320	119019.06
	KANKSA	Paschim Narayanpur	ZONE_6	23° 36' 21.542" N 23° 36' 56.299" N	87° 30' 37.639" E 87° 31' 13.922" E	1714.07	420	146422.28
DAMODAR	ANDAL, RANIGANGE	Tiarmana, Madanpur	ZONE_7	23° 34' 32.287" N 23° 33' 56.481" N	87° 7' 47.719" E 87° 10' 14.436" E	4000.00	1,500.00	1407552.48

NO MINING ZONE:

As per the Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) 2020 the restricted zone for mining is a distance from the bank is ¼th of river width and not be less than 7.5 meters. Also, there is a no mining zone up to a distance of 1 kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side.

No mining zone has been marked for an area up to a width of 100 meters from the active edge of embankments. Also, the concave side of the river is marked as no mining zone, as mining is this area will affect the course of river in future and will erode the river bank. A representative map of no mining zone shown on River Ajay of Paschim Bardhaman district is given in Figure 7.7. Table 7.15 summarized the area of no mining zones demarcated for each river of the district.

Table 7.16: No mining zone in the district

District Name	RIVER NAME	ZONE	Block Name	RESTRICTED AREA (SQ MTS)
Paschim Bardhaman	AJAY RIVER	1	SALANPUR, BARABANI	173354.46
		2	PANDABESWAR, BARABANI, JAMURIA	1044734.69
		3	PANDABESWAR, FARIDPUR	4108.452067
		4	KANKSA	110826.53
		5	KANKSA	7879.580469
		6	KANKSA	23399.97
	Damodar	7	ANDAL, RANIGANGE	490026.15

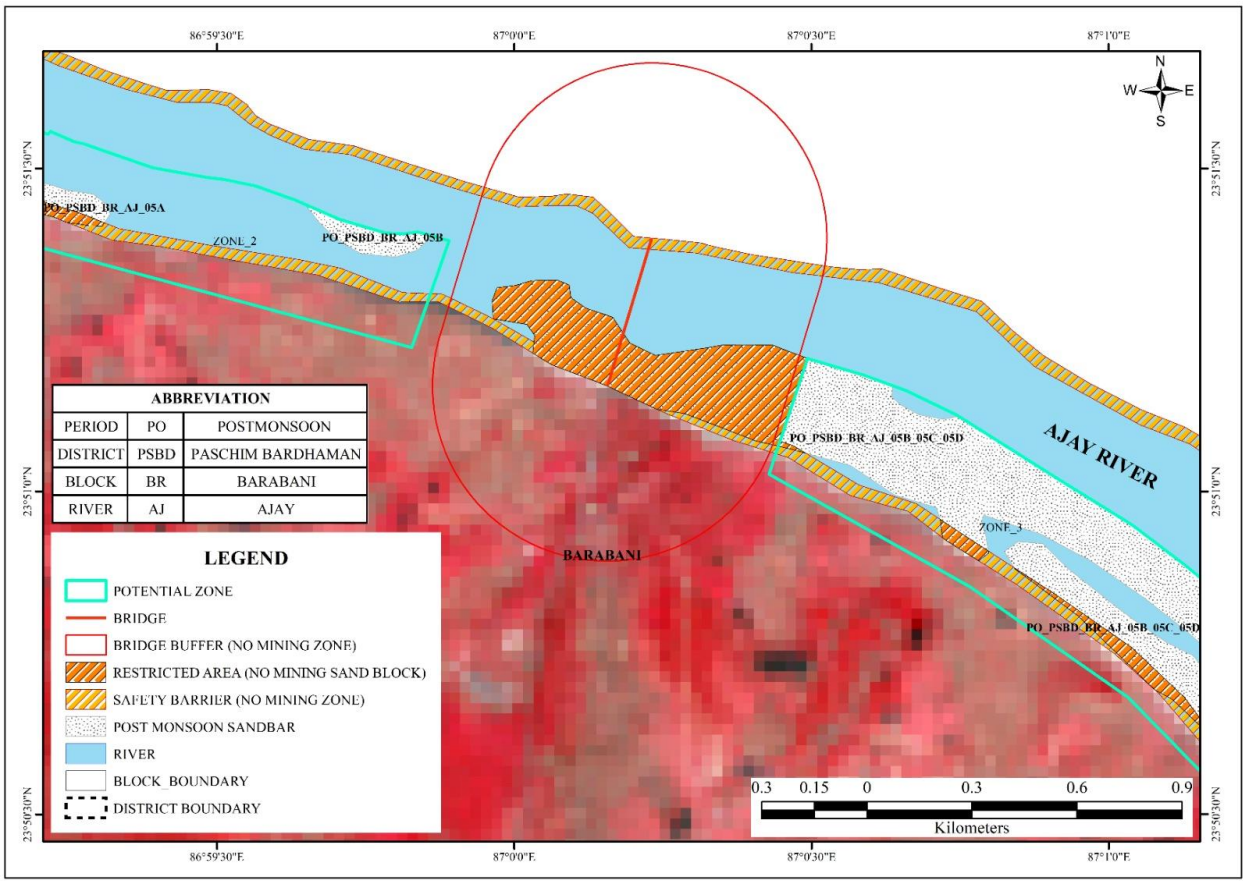


Figure 7.7: A representative map showing no-mining zone demarcated on Ajay River

8 Overview of mining activity in the district

8.1 General overview

Paschim Bardhaman district is a predominantly urban mining-industrial district in West Bengal. Coal excavation is one of the main major mineral mining of the district.

Coal mining in India first started in the Raniganj Coalfield. In 1774, John Sumner and Suetonius Grant Heatly of the British East India Company found coal near Ethora, presently in Salanpur CD Block. In 1973, the Government of India took over the management of all non-coking coal mines in the country and in 1975 Coal India was formed to manage the coking and non-coking coal mines. Eastern Coalfields has been producing around 30 million tonnes per annum from its open cast mines, it has been modernising its underground mines to produce around 10 million tonnes per annum from its underground mines.

Collection of sand from Ajay, Damodar and Barakar river-bed is one of the main minor mineral sources of the district.

8.2 List of existing mining leases of the districts

Details of existing mining leases and approved mining plans of the districts is furnished below.

Table 8.1: Details of mining leases of the districts (Sand)

Office of the Addl. District Magistrate and District Land & Land Reforms Officer, Paschim Bardhaman

Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude(minimum 4 geo coordinates)	Longitude (minimum 4 geocoordinates)	MINEABLE RESERVE	LOI DATE
1	KOILASH MAHATO	1998/SB2021	Ajay	Jamuria	Desher Mohan	14	583(P)	23.78460°N 23.78186°N 23.78121°N 23.78184°N 23.78430°N	87.10739°E 87.10937°E 87.10820°E 87.10769°E 87.10703°E	APPLIED FOR E.C.	17.06.2019
2	DEBNATH ENTERPRISE	1999/SB2021	Ajay	Jamuria	Desher Mohan	14	583(P)	23°46'53.27"N 23°46'46.94"N 23°46'44.49"N 23°46'50.69"N	87°06'34.68"E 87°06'38.75"E 87°06'33.67"E 87°06'29.75"E	APPLIED FOR E.C.	15.01.2019
3	M/S GANESH NANDY	2000/SB2021	Ajay	Jamuria	Desher Mohan	14	583(P)	23°46'44.33"N 23°46'37.66"N 23°46'40.40"N 23°46'46.64"N	87°06'34.23"E 87°06'38.44"N 87°06'43.46"N 87°06'39.41"N	APPLIED FOR E.C.	15.01.2019
4	LALTU DUTTA	2001/SB2021	Ajay	Jamuria	Desher Mohan	14	583(P)	23°46'36.69"N 23°46'30.56"N 23°46'31.87"N 23°46'39.12"N	87°06'39.15"E 87°06'42.49"E 87°06'47.53"E 87°06'44.23"E	APPLIED FOR E.C.	15.01.2019
5	LALTU DUTTA	2002/SB2021	Ajay	Jamuria	Darbardanga	44	1565(P)	23°45'03.62"N 23°45'01.67"N 23°45'06.60"N 23°45'08.64"N	87°08'56.04"E 87°09'01.71"E 87°09'02.87"E 87°08'56.48"E	APPLIED FOR E.C.	15.01.2019
6	RELIANCE STONE PRODUCT	2003/SB2021	Ajay	Jamuria	Darbardanga	44	1565(P)	23°45'02.6"N	87°09'5.9"E	APPLIED FOR E.C.	LoI
7	M/S NATIONAL TRADERS	2005/SB2021	Ajay	Barabani	Parulbaria	1	2366(P)	23°51'46.84"N 23°51'39.28"N 23°51'36.84"N 23°51'42.78"N 23°51'44.83"N	86°58'52.70"E 86°59'01.02"E 86°58'54.42"E 86°58'51.05"E 86°58'56.59"E	APPLIED FOR E.C.	15.01.2019
8	SARAN ALCOHOL PVT. LTD.	2006/SB2021	Ajay	Barabani	Putulia	13	1108(P)	23°51'12.66"N 23°51'11.75"N 23°51'10.09"N 23°51'04.34"N 23°51'05.29"N 23°51'06.96"N	87°00'25.53"E 87°00'29.97"E 87°00'33.03"E 87°00'30.70"E 87°00'29.11"E 87°00'24.93"E	APPLIED FOR E.C.	17.06.2019

Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude(minimum 4 geo coordinates)	Longitude (minimum 4 geocoordinates)	MINEABLE RESERVE	LOI DATE
9	SHREENATHJI DISTRIBUTORS	2007/SB2021	Ajay	Barabani	Putulia	13	1108(P)	23°51'5.61"N	87°0'35.01"E	APPLIED FOR E.C.	14.03.2022
10	MAIHAR DEVELOPERS	2008/SB2021	Ajay	Barabani	Putulia	13	1108(P)	23°51'06.68"N 23°51'03.11"N 23°50'57.93"N 23°51'01.11"N	87°00'39.51"E 87°00'46.26"E 87°00'44.12"E 87°00'37.34"E	APPLIED FOR E.C.	15.01.2019
11	AJAY TIWARI	2009/SB2021	Ajay	Barabani	Rasunpur	16	1673(P)	23°49'31.51"N 23°49'23.84"N 23°49'20.40"N 23°49'23.31"N 23°49'30.08"N	87°02'58.36"E 87°03'06.84"E 87°03'03.88"E 87°03'01.24"E 87°02'56.72"E	APPLIED FOR E.C.	15.01.2019
12	STARNET MARKETING PVT. LTD.	2010/SB2021	Ajay	Barabani	Rasunpur	16	1673(P)	23°49'13.36"N	87°3'15.76"E	APPLIED FOR E.C.	15.01.2019
13	LIBRA RETAILER PVT. LTD.	2011/SB2021	Ajay	Barabani	Rasunpur	16	1673(P)	23°49'10.19"N 23°49'08.43"N 23°49'04.34"N 23°49'07.56"N	87°03'26.30"E 87°03'31.79"E 87°03'30.24"E 87°03'25.57"E	APPLIED FOR E.C.	17.06.2019
14	BINOD SHAW	476/SB2021	Ajay	Pandaveswar	Deshlopa	8	610 (P)	23°43'20.38"N 23°43'19.35"N 23°43'18.68"N 23°43'15.12"N 23°43'15.76"N 23°43'16.88"N	87°18'44.14"E 87°18'48.12"E 87°18'50.58"E 87°18'49.54"E 87°18'47.21"E 87°18'43.41"E	1790454 CFT. LEASE EXPIRED	29.11.2017
15	BINOD SHAW	478/SB2021	Ajay	Pandaveswar	Deshlopa	8	610 (P)	23°43'18.23"N 23°43'16.12"N 23°43'13.53"N 23°43'14.71"N	87°18'50.95"E 87°18'55.89"E 87°18'55.50"E 87°18'50.02"E	1250139 CFT. LEASE EXPIRED	29.11.2017
16	SRI MANOJ KUMAR SINGH	489/SB2021	Ajay	Kanksha	Rautdihi	25	953(P)	23°38'05.45"N 23°38'06.45"N 23°38'04.26"N 23°38'01.97"N 23°37'59.05"N 23°37'57.70"N	87°25'44.19"E 87°25'45.97"E 87°25'50.48"E 87°25'53.33"E 87°25'56.56"E 87°25'54.24"E	2351957 CFT. RUNNING	20.12.2017
17	SK SAIFUL UDDIN	491/SB2021	Ajay	Kanksha	Kotalpukur	30	915(P)	23°36'42.79"N 23°36'44.27"N 23°36'44.47"N 23°36'46.02"N 23°36'47.12"N 23°36'46.11"N 23°36'44.63"N 23°36'44.24"N	87°27'49.71"E 87°27'49.83"E 87°27'51.84"E 87°27'57.55"E 87°28'07.20"E 87°28'07.36"E 87°28'05.03"E 87°28'03.71"E	2525811 CFT. RUNNING	16.03.2018

Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude(minimum 4 geo coordinates)	Longitude (minimum 4 geocoordinates)	MINEABLE RESERVE	LOI DATE
18	AJAY PRATAP SINGH	493/SB2021	Ajay	Kanksha	Satkahania	34	675(P)	23°36'07.51"N 23°36'05.29"N 23°36'05.29"N 23°36'04.50"N 23°36'04.30"N 23°36'04.62"N	87°29'45.02"E 87°29'58.09"E 87°29'58.60"E 87°29'58.57"E 87°29'51.41"E 87°29'46.28"E	1197167 CFT. RUNNING	09.01.2018
19	M/S RAJEN ROY	494/SB2021	Ajay	Kanksha	Basudha	35	4785(P)	23°36'53.74"N 23°36'52.27"N 23°36'51.88"N 23°36'55.15"N 23°36'58.04"N 23°36'56.80"N	87°31'04.54"E 87°30'55.69"E 87°30'54.68"E 87°30'53.51"E 87°31'01.73"E 87°31'03.60"E	3040593 CFT. LEASE EXPIRED	29.11.2017
20	ANIRUDDHA BANERJEE	496/SB2021	Ajay	Kanksha	Basudha	35	4785(P)	23°36'59.85"N 23°37'01.50"N 23°36'55.15"N 23°36'53.83"N	87°31'02.61"E 87°31'09.18"E 87°31'12.69"E 87°31'07.22"E	2807516 CFT. LEASE EXPIRED	29.11.2017
21	ANIRUDDHA BANERJEE	2012/SB2021	Ajay	Kanksha	Basudha	35	1255(P), 4787(P)	23°37'05.46"N 23°37'04.31"N 23°37'01.13"N 23°36'58.93"N 23°36'58.52"N	87°31'30.49"E 87°31'37.90"E 87°31'37.57"E 87°31'34.73"E 87°31'30.38"E	UNWILLING TO CARRY OUT MINING OPERATION	09.01.2018
22	CHANDA ENTERPRISE	498/SB2021	Ajay	Jamuria	Semalya	66	2780(P)	23°44'44.77"N 23°44'42.19"N 23°44'36.55"N 23°44'39.20"N	87°12'46.68"E 87°12'51.39"E 87°12'49.58"E 87°12'43.13"E	2871082 CFT. RUNNING	20.03.2018
23	INDIA DIGITAL ENTERTAINMENT PVT. LTD.	502/SB2021	Ajay	Jamuria	Chinchurbil	5	1283(P)	23°47'31.03"N 23°47'33.12"N 23°47'26.61"N 23°47'24.61"N	87°06'05.57"E 87°06'09.98"E 87°06'13.79"E 87°06'09.58"E	2733355 CFT. RUNNING	26.02.2018
24	RUPUCHAK ENTERPRISES	2095/SB2021	Ajay	Salanpur	Fatepur	103	3(P)	23°52'00.92"N 23°52'01.50"N 23°52'05.44"N 23°52'06.28"N 23°52'06.78"N 23°52'08.83"N 23°52'05.63"N 23°52'02.05"N	86°55'56.27"E 86°55'56.15"E 86°55'53.78"E 86°55'53.11"E 86°55'52.85"E 86°55'56.24"E 86°55'58.79"E 86°55'59.59"E	2023530 CFT. RUNNING	08.02.2018
25	ANIL KUMAR SINGH	2096/SB2021	Ajay	Salanpur	Fatepur	103	3(P)	23°51'54.03"N 23°51'55.22"N 23°51'59.23"N 23°52'00.95"N 23°52'02.01"N 23°52'00.95"N 23°51'56.79"N 23°51'53.91"N	86°55'57.22"E 86°55'57.24"E 86°55'56.66"E 86°55'56.27"E 86°55'59.57"E 86°55'59.86"E 86°56'00.82"E 86°56'01.27"E	2055313 CFT. RUNNING	12.02.2018

Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude(minimum 4 geo coordinates)	Longitude (minimum 4 geocoordinates)	MINEABLE RESERVE	LOI DATE
26	HEMENDRA OJHA AND CO	504/SB2021	Damodar	Andal	Tialmana	49	51(P),52(P),54(P),55,57(P),56(P),61(P),62(P),63(P),64(P),65,60(P),73(P),42(P),	23°34'10.05"N 23°34'07.34"N 23°34'02.39"N 23°34'01.33"N 23°34'02.28"N 23°34'04.76"N	87°09'05.79"E 87°09'09.97"E 87°09'15.29"E 87°09'14.36"E 87°09'07.97"E 87°09'02.60"E	4237760 CFT. RUNNING	29.11.2017
27	RAINBOW INFRUSTUCUE AND HOUSING DEVELOPMENT LTD.	2097/SB2021	Ajay	Salanpur	Fatepur	103	3(P)	23°51'54.02"N 23°51'53.89"N 23°51'44.71"N 23°51'44.71"N 23°51'45.75"N 23°51'47.86"N	86°55'57.19"E 86°56'01.27"E 86°56'01.28"E 86°56'0.18"E 86°55'56.21"E 86°55'56.85"E	UNWILLING TO CARRY OUT MINING OPERATION	15.02.2017
28	Bikalpa Traders Pvt. Ltd.	2014/SB2021	Ajay	Jamuria	Birkulti	15	2065(P)	23°45'56.22"N 23°45'51.77"N 23°45'48.03"N 23°45'51.70"N	87°07'23.51"E 87°07'32.32"E 87°07'30.56"E 87°07'21.00"E	3644473 CFT. RUNNING	20.03.2017
29	Bikalpa Traders Pvt. Ltd.	506/SB2021	Ajay	Jamuria	Birkulti	15	2065(P)	23°45'51.74"N 23°45'48.74"N 23°45'44.67"N 23°45'47.67"N	87°07'34.09"E 87°07'38.91"E 87°07'36.78"E 87°07'31.62"E	2034125 CFT. LEASE EXPIRED	20.03.2017
30	Bikalpa Traders Pvt. Ltd.	509/SB2021	Ajay	Jamuria	Birkulti	15	2065(P)	23°45'47.83"N 23°45'44.37"N 23°45'39.46"N 23°45'43.63"N	87°07'40.40"E 87°07'45.91"E 87°07'43.05"E 87°07'37.95"E	2574439 CFT. LEASE EXPIRED	20.03.2017
31	Bikalpa Traders Pvt. Ltd.	2015/SB2021	Ajay	Jamuria	Birkulti	15	2065(P)	23°45'42.91"N 23°45'37.90"N 23°45'35.30"N 23°45'37.54"N	87°07'49.46"E 87°07'56.18"E 87°07'54.76"E 87°07'45.97"E	3061377 CFT. RUNNING	20.03.2017
32	ANKUR BIOCHEM PVT LTD	512/SB2021	Ajay	Barabani	Putulia	13	1108(P)	23°51'03.02"N 23°50'59.74"N 23°50'54.86"N 23°50'57.94"N	87°00'46.32"E 87°00'52.68"E 87°00'50.58"E 87°00'44.15"E	3072376 CFT. RUNNING	09.03.2017
33	Surya Narayan Singh	514/SB2021	Ajay	Barabani	Putulia	13	1108(P)	23°50'59.68"N 23°50'56.11"N 23°50'50.98"N 23°50'54.87"N	87°00'52.74"E 87°00'59.49"E 87°00'57.29"E 87°00'50.68"E	3241886 CFT. LEASE EXPIRED	03.03.2017
34	Sudheswar Kumar	516/SB2021	Ajay	Barabani	Rasunpur	16	1673(P)	23°49'23.80"N 23°49'20.12"N 23°49'17.95"N 23°49'13.05"N 23°49'20.36"N	87°03'06.92"E 87°03'10.98"E 87°03'13.74"E 87°03'10.48"E 87°03'03.84"E	3803390 CFT. LEASE EXPIRED	20.03.2017

Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude(minimum 4 geo coordinates)	Longitude (minimum 4 geocoordinates)	MINEABLE RESERVE	LOI DATE
35	Somrith Enterprise	523/SB2021	Kunur	Kanksha	Keshabpur	66	539(P)	23°32'45.81"N 23°32'45.68"N 23°32'45.89"N 23°32'45.34"N 23°32'44.95"N 23°32'45.32"N	87°25'35.11"E 87°25'36.69"E 87°25'39.22"E 87°25'39.29"E 87°25'36.62"E 87°25'35.09"E	50641 CFT. LEASE EXPIRED	20.03.2017
36	Banshidhar Construction Pvt. Ltd.	2013/SB2021	Ajay	Kanksha	Radhanagar	24	514(P)	23°38'11.23"N 23°38'12.48"N 23°38'06.51"N 23°38'05.76."N	87°25'37.90"E 87°25'40.27"E 87°25'45.27"E 87°25'43.85"E	UNWILLING TO CARRY OUT MINING OPERATION	06.09.2017
37	Coinage Hotel and Resorts Pvt. Ltd.	527/SB2021	Ajay	Pandaveswar	Kendrakhottadi	1	3331(P)	23°44'42.896"N 23°44'43.578"N 23°44'39.619"N 23°44'38.860"N 23°44'40.701"N 23°44'40.469"N 23°44'41.487"N	87°14'44.664"E 87°14'51.251"E 87°14'51.365"E 87°14'48.444"E 87°14'47.471"E 87°14'45.909"E 87°14'44.651"E	1631538 CFT. LEASE EXPIRED	22.03.2017
38	Chinmoy Mondal	528/SB2021	Damodar	Andal	Tialmana	49	66(P), 67(P)	23°33'56.16"N 23°33'55.96"N 23°33'59.32"N 23°33'59.33"N 23°34'01.16"N 23°33'59.37"N 23°33'53.19"N	87°09'23.38"E 87°09'19.85"E 87°09'19.73"E 87°09'21.56"E 87°09'25.31"E 87°09'28.80"E 87°09'27.24"E	3733043 CFT. LEASE EXPIRED	29.03.2017
39	Premi Arora	531/SB2021	Damodar	Andal	Tialmana	49	66(P), 67(P)	23°33'58.18"N 23°33'53.69"N 23°33'52.60"N 23°33'48.73"N 23°33'52.54"N	87°09'27.91"E 87°09'33.90"E 87°09'36.66"E 87°09'35.60"E 87°09'26.21"E	3602096 CFT. LEASE EXPIRED	11.04.2017
40	Vaishno Devi Enterprises	532/SB2021	Damodar	Andal	Tialmana	49	66(P), 67(P)	23°33'49.59"N 23°33'52.31"N 23°33'51.51"N 23°33'46.03"N 23°33'49.37"N	87°09'37.15"E 87°09'38.48"E 87°09'47.32"E 87°09'46.42"E 87°09'36.21"E	3628582 CFT. LEASE EXPIRED	06.04.2017
41	AMBEY ABASAN PVT LIMITED	2016/SB2021	Ajay	Jamuria	Semalya	66	2780(P)	23°45'02.51"N 23°44'58.81"N 23°44'58.91"N 23°45'00.32"N 23°45'01.91"N	87°11'55.50"E 87°11'55.74"E 87°11'47.03"E 87°11'43.07"E 87°11'42.91"E	2945246 CFT. RUNNING	07.09.2017
42	TRIUMPH SALES AND SERVICES	540/SB2021	Ajay	Jamuria	Semalya	66	2780(P)	23°45'02.51"N 23°45'01.89"N 23°44'59.35"N 23°44'58.39"N 23°44'59.23"N 23°44'58.81"N	87°11'55.50"E 87°12'00.65"E 87°12'09.69"E 87°12'06.40"E 87°12'03.08"E 87°12'55.72"E	2214230 CFT. RUNNING	07.09.2017

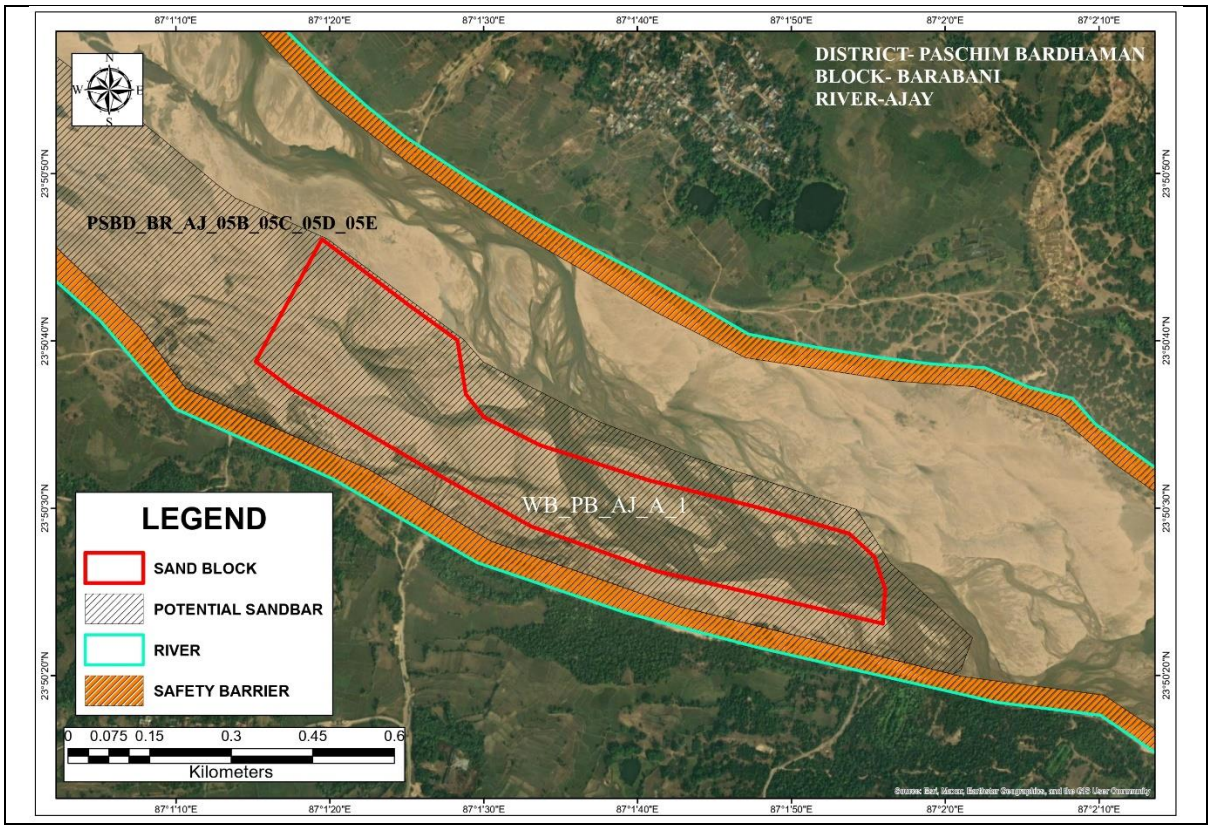
Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude(minimum 4 geo coordinates)	Longitude (minimum 4 geocoordinates)	MINEABLE RESERVE	LOI DATE
43	KIRAN KHAN	541/SB2021	Damodar	Ranigunj	Nupur	31	1891(P), 2396(P)	23°34'23.35"N 23°34'22.13"N 23°34'16.55"N 23°34'19.27"N	87°08'13.18"E 87°08'23.39"E 87°08'22.08"E 87°08'12.42"E	3998856 CFT. LEASE EXPIRED	07.09.2017
44	ANKUR BIOCHEM PVT LTD	542/SB2021	Damodar	Ranigunj	Nupur	31	1891(P), 2396(P)	23°34'19.30"N 23°34'12.88"N 23°34'15.34"N 23°34'21.22"N	87°08'33.93"E 87°08'32.24"E 87°08'23.85"E 87°08'25.36"E	4470837 CFT. LEASE EXPIRED	07.09.2017
45	SUDIP KUMAR DEY	827/SB2021	Ajay	Salanpur	Fatepur	103	3(P)	23°51'44.70"N 23°51'37.07"N 23°51'38.43"N 23°51'42.54"N 23°51'45.73"N	86°56'00.18"E 85°55'58.06"E 85°55'54.24"E 85°55'55.21"E 85°55'56.21"E	1748076 CFT. LEASE EXPIRED	07.09.2017
46	BALAJI TRADING CO	564/SB2021	Ajay	Pandaveswar	Baidyanathpur	5	1268(P)	23°43'39.64"N 23°43'36.20"N 23°43'34.92"N 23°43'37.06"N 23°43'37.39"N	87°17'06.71"E 87°17'12.06"E 87°17'12.58"E 87°17'07.27"E 87°17'05.94"E	593286 CFT. LEASE EXPIRED	07.09.2017
47	TRIUMPH SALES AND SERVICES	2017/SB2021	Damodar	Andal	Tialmana	49	5 (P), 42 (P), 41(P), 40(P), 39(P), 44(P)	23°34'09.60"N 23°34'07.19"N 23°34'01.61"N 23°34'07.49"N	87°08'55.27"E 87°09'05.69"E 87°09'02.97"E 87°08'52.22"E	4131819 CFT. NOT YET STARTED	07.09.2017

8.3 List of Auctioned sand mining leases of the districts

Based on DSR potential blocks, sand blocks are auctioned for the district which area given as Table 8.2 and map of these blocks are given as Figure 8.1.

Table 8.2: List of WBMDTCL Sand Auction Block of the district

Sr. No.	Name	Area (Ha)	Potential Block	Block	River	Status
1	WB_PB_AJ_A_1	21.35	PSBD_BR_AJ_05B_05C_05D_05E	Barabani	Ajay	Auctioned
2	WB_PB_AJ_B_1	4.61	PSBD_BR_AJ_05G	Barabani	Ajay	Auctioned
3	WB_PB_AJ_B_3	4.55	PSBD_JM_AJ_08E_1	Jamuria	Ajay	Auctioned



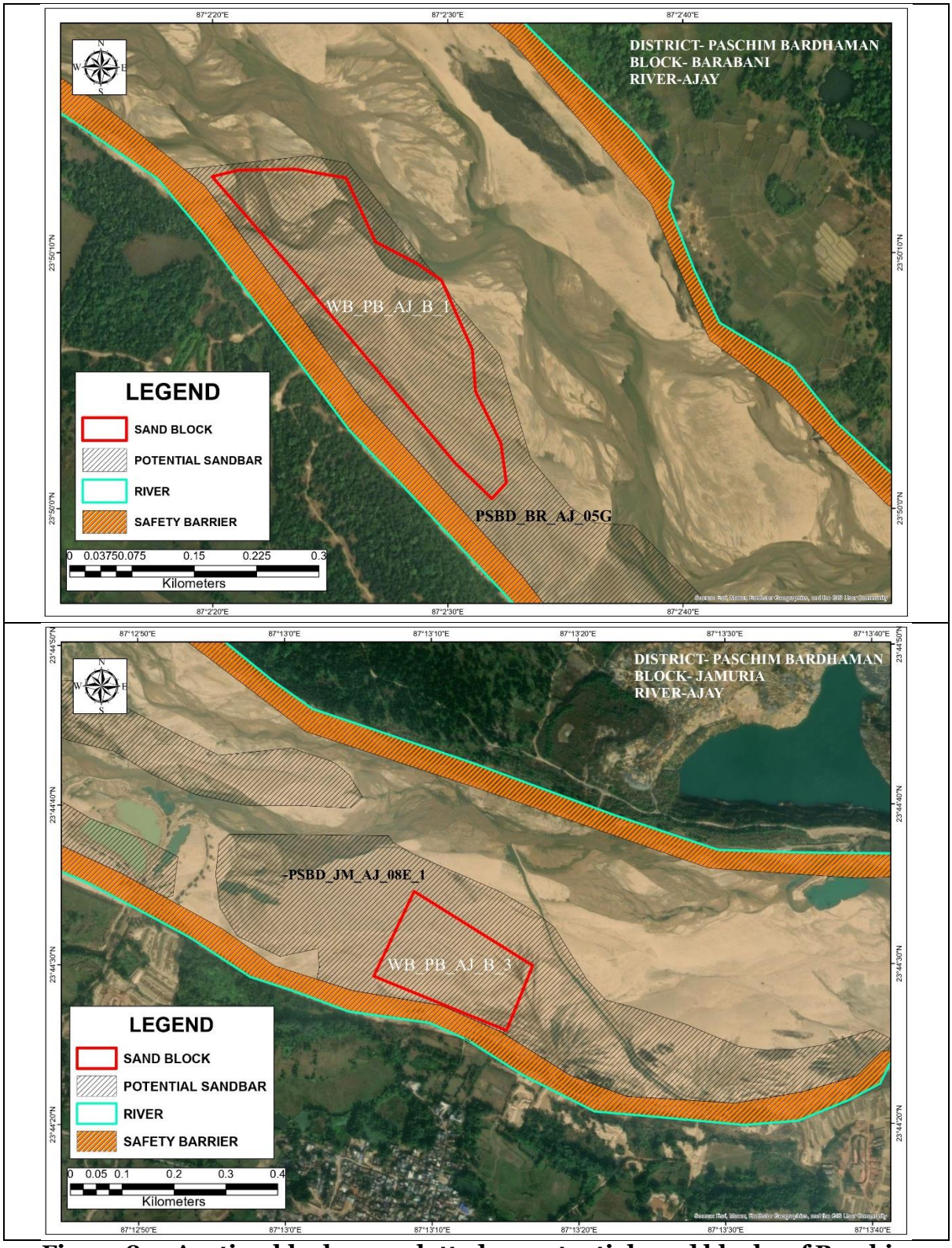


Figure 8.1: Auction block map plotted on potential sand blocks of Paschim Bardhaman District

8.4 Detail of production of sand and other minerals

Four years production of minor minerals (sand and other than sand) of Paschim Bardhaman District is furnished in Table 8.2.

Table 8.3: Details of production of sand in Paschim Bardhaman district

Office of the Addl. District Magistrate and District Land & Land Reforms Officer, Paschim Bardhaman

Sl. No.	Year	Name of mineral	Total Production in cft.	Total Production in cum
1	2017-2018	Sand	8653176	245028.34
2	2018-2019	Sand	21476159	608131.36
3	2019-2020	Sand	27377587	775239.61
4	2020-2021	Sand	31241232	884644.83

Conversion factor: 1 cum=35.315 cft

9 Details of revenue generated from mineral sector

Revenue generated from minor minerals (sand and other than sand) in Paschim Bardhaman District is furnished in Table 9.1.

Table 9.1: District revenue generation from mineral sector (sand and other than sand)

(In Rs.)

Year	Royalty	Cess	Total revenue
Sand			
2017-2018	13066296	9046010	22112306
2018-2019	32429000	3067826	35496826
2019-2020	41340157	3799815	45139972
2020-2021	47174260	-	31241232
Other than sand			
2017-2018	18329598	1875184	20204782
2018-2019	27561261	3243029	30804290
2019-2020	41312615	2366668	43679283

10 Transport (Railway, road)

Entire Paschim Bardhaman is covered with road networks and the maximum concentration and the road transport are adequate in terms of bus availability and goods flow. NH 18 (NH 32) connects this district with Jamshedpur, Bokaro, Chas and Dhanbad. National Highway 60A connects Paschim Bardhhaman with State Highway 9 at Bankura and subsequently to NH 2 at Durgapur with high road density. Currently, Highway 5 also plays an important role in district's transport network as it connects the towns like Raghunathpur, Adra, Santaldih and Neturia to NH 2 at Neamatpur and Asansol. Paschim Bardhhaman has excellent road connectivity with Raniganj-Asansol industrial belt. South Bengal State Transport Corporation runs 4 buses from Paschim Bardhaman to Kolkata via State Highway 5 thus connecting towns and cities like Raghunathpur, Adra, Neturia to the industrial belt of Asansol, Raniganj, Durgapur and Bardhhaman. There are also many private bus operators on this route.

A transportation map of Paschim Bardhaman district has been prepared and presented in Figure 10.1.

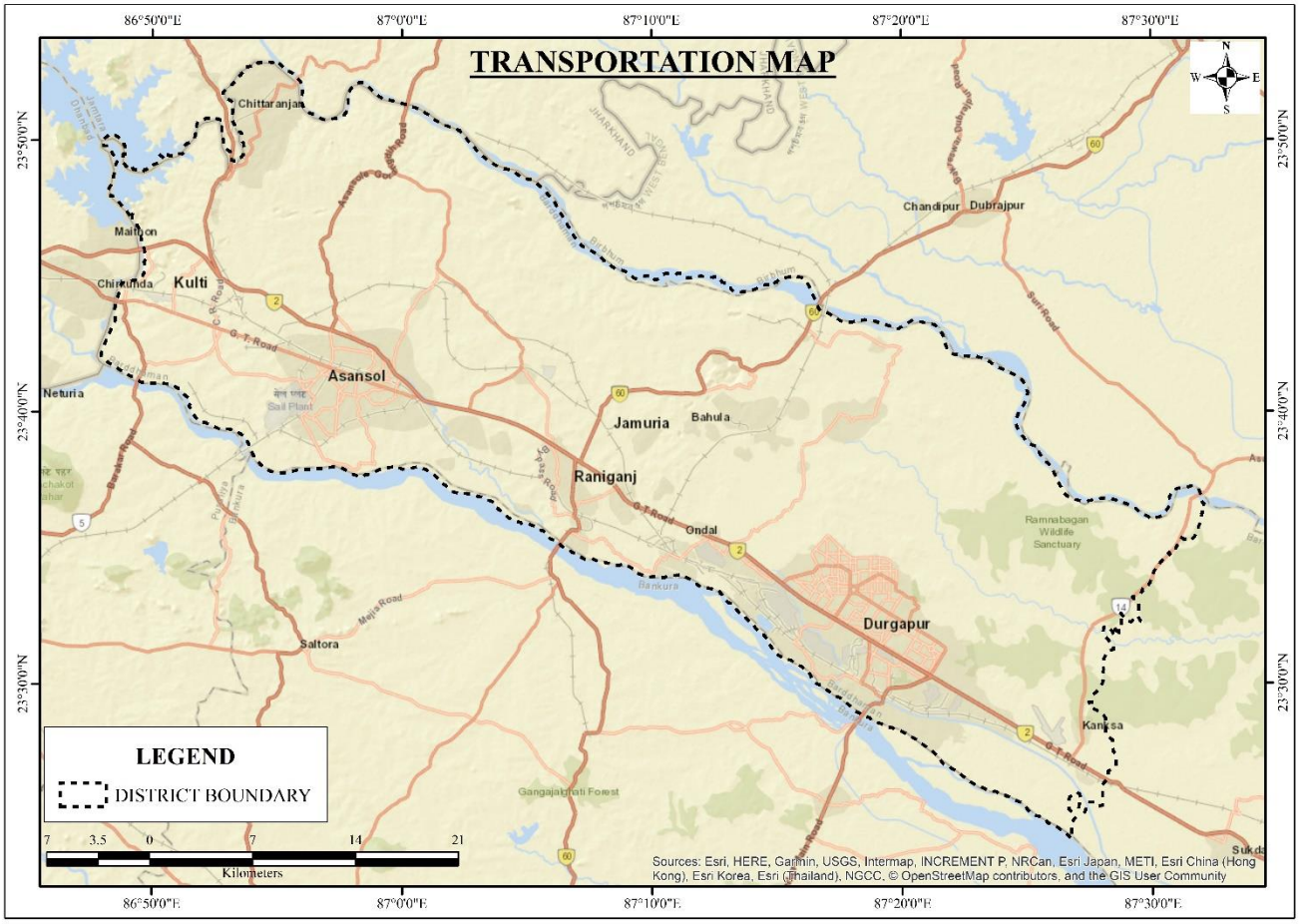


Figure 10.1: Transportation map of Paschim Bardhaman District
(*National Informatics Centre*)

The transportation via train is another important conveyance medium of Paschim Bardhhaman. Factually, Narayankuri ghat, on the bank of river Damodar, was used by Carr Tagore & Company for transporting coal to Kolkata by boat in the middle of the nineteenth century (*Asansol, RailIndia;2017*). Fluctuating water levels of the rain-fed river Damodar created problems for transportation and hindered business flow. Therefore, in order to capture the profitable coal transport business, East Indian Railway laid lines up to Raniganj in the year of1855 (Asansol, Rail India; 2017). As a result of that, it captured the complete coal transport business. Afterward, the line was extended to Asansol in1863 (*Asansol, Rail India; 2017*). Currently, Asansol Division of Eastern Railway handles around1, 300 wagons of coal every day. The Howrah-Delhi main line via Asansol and Patna of East Indian Railway was made operable in 1871 and the Grand Chord from Sitarampur to Mughalsarai was completed in1901, shortening the travel distance between Howrah and Delhi. Bengal Nagpur Railway linked its operations in the Nagpur-Chandil sector to Asansol in 1887. With all these links Asansol emerged as a major railway junction. Asansol has an electric loco shed and an EMU shed. There is a diesel loco shed at Andal and Andal also has a large goods yard, apart from those at Sitrampur and Barakar (The Chronology of Railway development in Eastern Indian, 2017). Presently the district is functioned by three numbers of rail networks provided by the South Eastern Railways. One-line tracks from Jharkhand in the South through the district up to Asansol passing through Adra division. Another line goes between Bankura and Dhanbad also via the Adra Division and the third The Railway Divisional Headquarter Adra railway division, which is one of the major rail divisions of South Eastern Railway, is situated on the North-East part of Paschim Bardhhaman district. *(www.wikipedia.org).*

The nearest international airport is Netaji Subhas Chandra Bose International Airport at Dum Dum in Kolkata. Domestic airport that serves the city is Kazi Nazrul Islam Airport. The airport is located in Andal and is roughly 15 km from Durgapur City Centre. It is around 25 km away from the Asansol City Bus Terminus and there is also a private airport located at Burnpur Riverside Area.

A transportation map demarcating approach road to the potential sand blocks from the nearest National Highway/ Sate Highway has been prepared and presented in Figure 10.2.

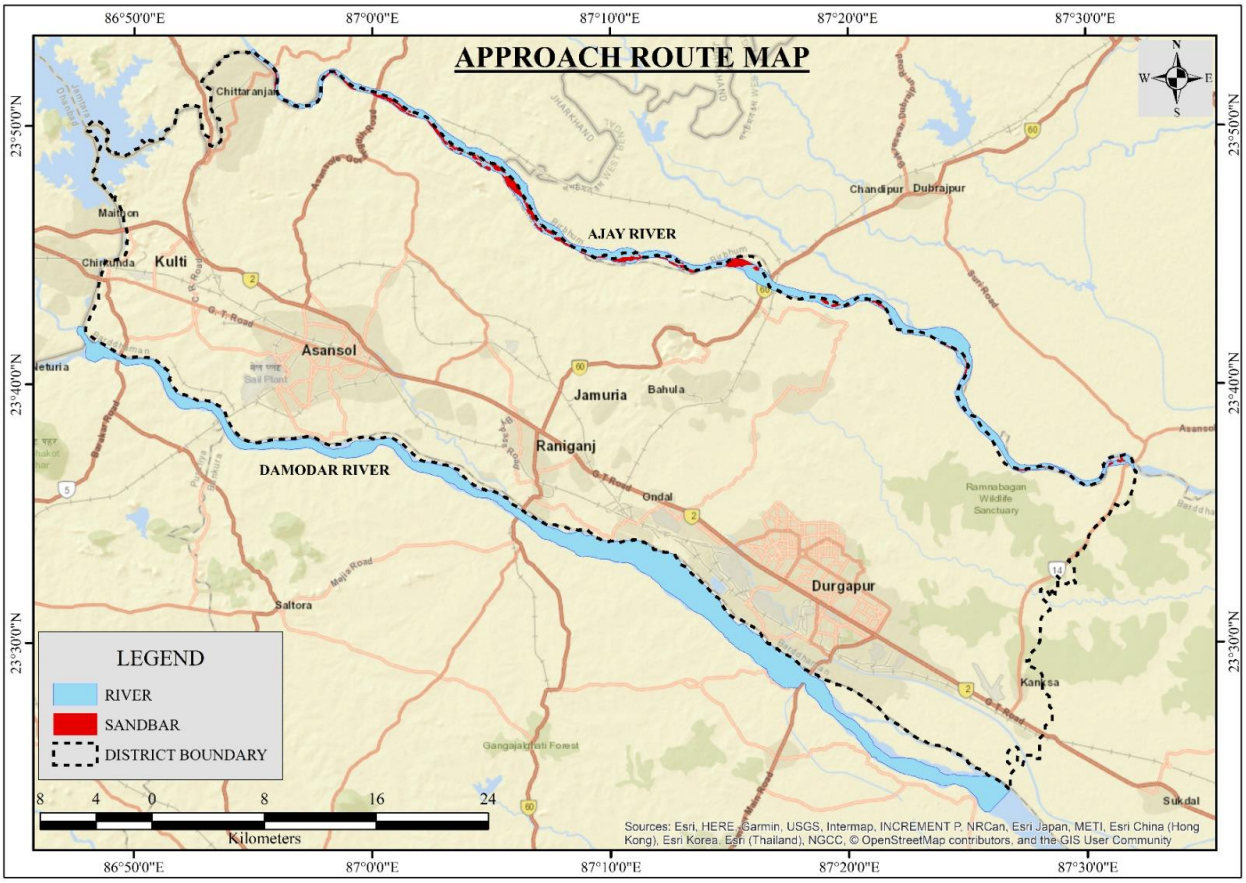


Figure 10.2: Map showing approach road to potential sandbars

PART B: INSITU MINOR MINERAL DEPOSITS

11 In-situ Minerals

11.1 Mineral Reserve

Paschim Bardhaman district is having diversified mineral deposits of both major and minor minerals. While coal is the predominant major mineral of the district. It has also a potential sand reserve suitable for construction activity. The other minor mineral occurrences include Blackstone, Quartz, Quartzite, China-clay, gravel, morrum etc. As such systematic G2 level exploration has not been carried out in the district but a discrete approach has been followed in order to grant the mining lease based on reported occurrences.

11.2 Mineral Potential

In this district survey report zones are identified based on the following criteria/ observation:

a. Extended zones beyond the existing leases has been identified both with ground validation and satellite imagery studies to define potential zones.
b. The areas with specific rock exposures, satellite imagery studies alongwith ground truthing is also is being opted to define potential mineralized zones.
c. Atleast in few instances potential zones are defined based on available geological maps/information superimposed in satellite imagery.

The lists of identified potential zones with respect to in-situ minor minerals are furnished in Table 11.1.

Table 11.1: In-situ Minerals Occurrences

Sl. No.	Name of the Mineral Zone Code	Name of the Mineral	Host rock of mineralization	Area of mineralized zone Ha)	Depth of mineralization	Geological resource (mcm)	Whether virgin or partially excavated	Nature of land (whether free for mining/ forest / agriculture)	Mineral reserve (approx) mentioning grade	Administrative block	Co-ordinate		Infra structure available near the mineralized zone
1	PB_BLDS_ZONE_1	Sandstone	Sandstone	34.15	25	6.83	Virgin	Agricultural	Unexplord	Barabani	23° 49' 52.636" N	86° 58' 7.413" E	Road network available
											23° 49' 37.285" N	86° 58' 41.459" E	
											23° 49' 28.637" N	86° 58' 36.223" E	
											23° 49' 42.526" N	86° 58' 2.458" E	
2	PB_BLDS_ZONE_2	Sandstone	Sandstone	24.17	25	4.83	Virgin	Agricultural	Unexplord	Barabani	23° 49' 54.044" N	86° 57' 21.444" E	Road network available
											23° 49' 46.093" N	86° 57' 48.241" E	
											23° 49' 34.520" N	86° 57' 42.025" E	
											23° 49' 43.935" N	86° 57' 22.055" E	
3	PB_BS_ZONE 1	Black Stone	Dyke	4.74	30	1.14	Partialy Excavated	Agricultural	Partially explored	Barabani	23° 47' 6.166" N	86° 57' 23.949" E	Road network available
											23° 47' 7.578" N	86° 57' 28.287" E	
											23° 46' 58.563" N	86° 57' 34.199" E	
											23° 46' 56.806" N	86° 57' 28.477" E	
4	PB_BS_ZONE 2	Black Stone	Dyke	3.02	30	0.72	Partialy Excavated	Agricultural	Partially explored	Barabani	23° 47' 30.837" N	86° 57' 21.626" E	Road network available
											23° 47' 31.285" N	86° 57' 25.459" E	
											23° 47' 23.422" N	86° 57' 26.397" E	
											23° 47' 22.560" N	86° 57' 21.703" E	
5	PB_BS_ZONE 3	Black Stone	Dyke	22.39	40	7.16	Partialy Excavated	Agricultural	Partially explored	Barabani	23° 46' 50.963" N	86° 57' 41.800" E	Road network available
											23° 46' 33.034" N	86° 58' 0.226" E	
											23° 46' 32.333" N	86° 57' 39.835" E	
											23° 46' 48.380" N	86° 57' 34.228" E	
6	PB_BS_ZONE 4	Black stone	Dyke	11.6	30	2.78	Partialy Excavated	Agricultural	Partially explored	Jamuria	23° 48' 17.314" N	87° 4' 11.051" E	Road network available
											23° 48' 25.107" N	87° 4' 14.926" E	
											23° 48' 28.548" N	87° 4' 16.620" E	

Sl. No.	Name of the Mineral Zone Code	Name of the Mineral	Host rock of mineralization	Area of mineralized zone Ha)	Depth of mineralization	Geological resource (mcm)	Whether virgin or partially excavated	Nature of land (whether free for mining/ forest / agriculture)	Mineral reserve (approx) mentioning grade	Administrative block	Co-ordinate		Infra structure available near the mineralized zone
											23° 48' 30.284" N	87° 4' 19.763" E	
											23° 48' 29.251" N	87° 4' 22.587" E	
											23° 48' 25.824" N	87° 4' 26.793" E	
											23° 48' 14.059" N	87° 4' 17.445" E	
7	PB_BS_ZONE_5	Black Stone	Dyke	308.23	40.00	98.63	Partialy Excavated	Agricultural	Partially explored	Barabani	23° 50' 21.145" N	86° 56' 19.394" E	Road network available
											23° 50' 25.105" N	86° 56' 40.604" E	
											23° 49' 19.850" N	86° 57' 9.078" E	
											23° 47' 56.794" N	86° 57' 28.197" E	
											23° 47' 50.009" N	86° 57' 8.872" E	
											23° 49' 57.491" N	86° 56' 31.272" E	
8	PB_BS_ZONE_6	Black Stone	Dyke	17.66	30	4.24	Virgin	Agricultural	Unexplord	Barabani	23° 49' 19.669" N	86° 58' 22.301" E	Road network available
											23° 49' 30.462" N	86° 58' 25.066" E	
											23° 49' 24.809" N	86° 58' 44.009" E	
											23° 49' 15.688" N	86° 58' 38.469" E	
9	PB_BS_ZONE_7	Black Stone	Dyke	1364.24	40	436.56	Partialy Excavated	Agricultural	Partially explored	Barabani, Jamuria	23° 48' 42.598" N	86° 59' 56.163" E	Road network available
											23° 48' 50.547" N	86° 59' 27.523" E	
											23° 49' 18.508" N	86° 59' 37.809" E	
											23° 49' 3.449" N	87° 1' 1.974" E	
											23° 48' 45.886" N	87° 1' 53.854" E	
											23° 48' 12.298" N	87° 3' 32.393" E	
											23° 47' 59.283" N	87° 4' 47.310" E	
											23° 46' 48.684" N	87° 6' 10.940" E	
											23° 46' 11.702" N	87° 5' 50.812" E	
											23° 47' 7.663" N	87° 4' 44.006" E	
											23° 47' 53.474" N	87° 2' 53.029" E	

Sl. No.	Name of the Mineral Zone Code	Name of the Mineral	Host rock of mineralization	Area of mineralized zone Ha)	Depth of mineralization	Geological resource (mcm)	Whether virgin or partially excavated	Nature of land (whether free for mining/ forest / agriculture)	Mineral reserve (approx) mentioning grade	Administrative block	Co-ordinate		Infra structure available near the mineralized zone
10	PB_BS_ZONE_8	Black Stone	Dyke	310.23	30	74.46	Virgin	Agricultural	Unexplord	Jamuria	23° 42' 12.657" N	87° 1' 48.045" E	Road network available
											23° 42' 27.854" N	87° 2' 18.438" E	
											23° 40' 37.676" N	87° 3' 9.999" E	
											23° 40' 33.877" N	87° 2' 41.776" E	
11	PB_BS_ZONE_9	Black Stone	Dyke	66.93	30	16.06	Virgin	Agricultural	Unexplord	Raniganj (M)	23° 37' 30.972" N	87° 3' 7.285" E	Road network available
											23° 37' 41.284" N	87° 3' 21.397" E	
											23° 36' 56.236" N	87° 3' 49.077" E	
											23° 36' 51.894" N	87° 3' 36.594" E	
12	PB_BS_ZONE_10	Black Stone	Dyke	661.44	40	211.66	Virgin	Agricultural	Unexplord	Asansol (Mc),Jamuria,Barabari	23° 44' 36.484" N	87° 2' 45.576" E	Road network available
											23° 44' 28.277" N	87° 2' 59.410" E	
											23° 41' 3.720" N	87° 0' 39.612" E	
											23° 40' 29.456" N	86° 59' 59.968" E	
											23° 40' 48.301" N	86° 59' 54.726" E	
											23° 41' 46.605" N	87° 0' 26.633" E	
13	PB_BS_ZONE_11	Black Stone	Dyke	307.97	40	98.55	Virgin	Agricultural	Unexplord	Asansol (Mc),Jamuria,Barabari	23° 40' 46.339" N	87° 0' 24.788" E	Road network available
											23° 40' 51.907" N	87° 0' 32.841" E	
											23° 37' 24.232" N	87° 2' 7.782" E	
											23° 37' 20.891" N	87° 1' 55.961" E	
											23° 39' 17.047" N	87° 0' 54.029" E	
14	PB_BS_ZONE_12	Black Stone	Metabasite	7.21	20	1.15	Virgin	Agricultural	Unexplord	Faridapur	23° 42' 59.509" N	87° 20' 2.524" E	Road network available
											23° 43' 6.336" N	87° 20' 18.064" E	
											23° 43' 0.648" N	87° 20' 18.983" E	
											23° 42' 55.334" N	87° 20' 4.377" E	
15	PB_BS_ZONE_13	Black stone	Dyke	31.00	25	6.20	Virgin	Agricultural	Unexplord	Salanpur	23° 50' 9.941" N	86° 52' 39.160" E	Road network available
											23° 50' 6.938" N	86° 52' 46.258" E	

Sl. No.	Name of the Mineral Zone Code	Name of the Mineral	Host rock of mineralization	Area of mineralized zone Ha)	Depth of mineralization	Geological resource (mcm)	Whether virgin or partially excavated	Nature of land (whether free for mining/ forest / agriculture)	Mineral reserve (approx) mentioning grade	Administrative block	Co-ordinate		Infra structure available near the mineralized zone
											23° 49' 48.440" N	86° 52' 44.985" E	
											23° 49' 34.820" N	86° 52' 33.078" E	
											23° 49' 41.501" N	86° 52' 27.339" E	
16	PB_BS_ZONE_14	Black Stone	Dyke	56.21	35	15.74	Virgin	Agricultural	Unexplord	Salanpur	23° 52' 3.490" N	86° 53' 27.552" E	Road network available
											23° 52' 5.058" N	86° 53' 15.207" E	
											23° 52' 20.939" N	86° 53' 30.163" E	
											23° 52' 40.718" N	86° 53' 44.876" E	
											23° 52' 42.877" N	86° 53' 56.440" E	
											23° 52' 42.825" N	86° 54' 8.463" E	
17	PB_BS_ZONE_15	Black Stone	Dyke	12.95	35	3.63	Virgin	Agricultural	Unexplord	Barabani	23° 49' 10.889" N	86° 59' 1.082" E	Road network available
											23° 49' 17.308" N	86° 58' 53.864" E	
											23° 49' 22.411" N	86° 58' 57.826" E	
											23° 49' 20.902" N	86° 59' 9.669" E	
											23° 49' 13.159" N	86° 59' 13.410" E	
18	PB_BS_ZONE_16	Black Stone	Metabasite	25.06	35	7.02	Virgin	Agricultural	Unexplord	Barabani	23° 44' 26.940" N	86° 58' 27.286" E	Road network available
											23° 44' 31.308" N	86° 58' 38.850" E	
											23° 44' 9.036" N	86° 58' 49.986" E	
											23° 44' 4.668" N	86° 58' 40.477" E	
19	PB_BS_ZONE_17	Black Stone	Metabasite	30.62	35	8.57	Virgin	Agricultural	Unexplord	Salanpur	23° 47' 14.576" N	86° 50' 11.272" E	Road network available
											23° 47' 31.948" N	86° 50' 23.967" E	
											23° 47' 25.061" N	86° 50' 36.199" E	
											23° 47' 3.628" N	86° 50' 23.761" E	
20	PB_CC_ZONE 1	China Clay	Sandstone	0.47	30	0.11	Partialy Excavated	Agricultural	Partially explored	Kanksa	23° 40' 25.015" N	87° 24' 48.787" E	Road network available
											23° 40' 27.258" N	87° 24' 49.690" E	
											23° 40' 26.530" N	87° 24' 51.538" E	

Sl. No.	Name of the Mineral Zone Code	Name of the Mineral	Host rock of mineralization	Area of mineralized zone Ha)	Depth of mineralization	Geological resource (mcm)	Whether virgin or partially excavated	Nature of land (whether free for mining/ forest / agriculture)	Mineral reserve (approx) mentioning grade	Administrative block	Co-ordinate		Infra structure available near the mineralized zone
											23° 40' 24.182" N	87° 24' 51.166" E	
21	PB_GL_ZONE 1	Gravel	Sandstone	1770.86	20	283.34	Partialy Excavated	Agricultural	Partially explored	Faridpur	23° 36' 57.072" N	87° 15' 55.828" E	Road network available
											23° 38' 25.139" N	87° 17' 6.547" E	
											23° 37' 7.656" N	87° 19' 23.169" E	
											23° 35' 13.876" N	87° 18' 35.812" E	
22	PB_GR_ZONE1	Granite/ Quartz/ Feldspar	Granite Gneiss	9.05	40	2.90	Partialy Excavated	Agricultural	Partially explored	Salanpur	23° 47' 24.090" N	86° 50' 48.853" E	Road network available
											23° 47' 17.259" N	86° 50' 57.836" E	
											23° 47' 11.854" N	86° 50' 53.086" E	
											23° 47' 10.485" N	86° 50' 51.883" E	
											23° 47' 13.919" N	86° 50' 47.985" E	
											23° 47' 16.353" N	86° 50' 45.223" E	
											23° 47' 19.070" N	86° 50' 42.140" E	
											23° 47' 19.745" N	86° 50' 43.042" E	
23	PB_GR_ZONE2	Granite/ Quartz/ Feldspar	Granite Gneiss	118.78	40	38.01	Virgin	Agricultural	Unexplord	Salanpur	23° 50' 19.826" N	86° 55' 10.762" E	Road network available
											23° 51' 1.881" N	86° 55' 21.727" E	
											23° 50' 58.131" N	86° 55' 51.311" E	
											23° 50' 15.325" N	86° 55' 43.735" E	
24	PB_GR_ZONE_3	Granite/ Quartz/ Feldspar	Granite Gneiss	112.02	30	26.89	Virgin	Agricultural	Unexplord	Salanpur	23° 48' 29.999" N	86° 52' 51.261" E	Road network available
											23° 48' 0.211" N	86° 53' 35.954" E	
											23° 47' 41.708" N	86° 53' 19.379" E	
											23° 48' 11.261" N	86° 52' 36.206" E	
25	PB_LR_ZONE _1	Laterite/ Chinal clay/ Fire clay	Laterite	527.54	15	63.30	Virgin	Agricultural	Unexplord	Faridpur	23° 36' 44.660" N	87° 20' 20.153" E	Road network available
											23° 37' 48.658" N	87° 20' 10.055" E	
											23° 37' 52.072" N	87° 20' 53.767" E	
											23° 36' 45.880" N	87° 21' 42.760" E	
											23° 36' 0.126" N	87° 21' 16.690" E	

Sl. No.	Name of the Mineral Zone Code	Name of the Mineral	Host rock of mineralization	Area of mineralized zone Ha)	Depth of mineralization	Geological resource (mcm)	Whether virgin or partially excavated	Nature of land (whether free for mining/ forest / agriculture)	Mineral reserve (approx) mentioning grade	Administrative block	Co-ordinate		Infra structure available near the mineralized zone
26	PB_LR_ZONE_2	Laterite/ Chinal clay/ Fire clay	Laterite	174.98	15	21.00	Virgin	Agricultural	Unexplord	Faridpur	23° 37' 53.139" N	87° 21' 19.431" E	Road network available
											23° 38' 12.286" N	87° 21' 13.730" E	
											23° 38' 21.462" N	87° 22' 3.512" E	
											23° 38' 27.278" N	87° 22' 45.488" E	
											23° 38' 8.814" N	87° 22' 45.835" E	
											23° 37' 51.557" N	87° 22' 46.160" E	
											23° 37' 49.489" N	87° 22' 18.962" E	
											23° 38' 10.487" N	87° 22' 16.481" E	
27	PB_LR_ZONE_3	Laterite/ Chinal clay/ Fire clay	Laterite	188.01	15	2256.14	Virgin	Agricultural	Unexplord	Kanksa	23° 38' 2.628" N	87° 23' 31.778" E	Road network available
											23° 38' 2.117" N	87° 24' 3.433" E	
											23° 36' 43.506" N	87° 24' 10.243" E	
											23° 36' 39.975" N	87° 23' 37.881" E	
											23° 37' 9.518" N	87° 23' 41.891" E	
											23° 37' 34.033" N	87° 23' 43.925" E	
											23° 37' 48.977" N	87° 23' 37.527" E	
28	PB_LR_ZONE_4	Laterite/ Chinal clay/ Fire clay	Laterite	100.39	15	1054.12	Virgin	Agricultural	Unexplord	Kanksa	23° 35' 20.111" N	87° 29' 11.723" E	Road network available
											23° 34' 54.533" N	87° 30' 0.355" E	
											23° 34' 35.599" N	87° 29' 48.803" E	
											23° 35' 1.297" N	87° 29' 2.972" E	
29	PB_LR_ZONE_5	Laterite/ Chinal clay/ Fire clay	Laterite	51.96	15	623.57	Virgin	Agricultural	Unexplord	Kanksa	23° 36' 30.156" N	87° 22' 49.138" E	Road network available
											23° 36' 30.291" N	87° 23' 18.268" E	
											23° 35' 56.986" N	87° 23' 14.809" E	
											23° 35' 55.554" N	87° 23' 9.502" E	
											23° 36' 19.060" N	87° 22' 55.380" E	
30		Quartz			30	3499.07		Agricultural		Salanpur	23° 47' 19.039" N	86° 52' 52.197" E	

Sl. No.	Name of the Mineral Zone Code	Name of the Mineral	Host rock of mineralization	Area of mineralized zone Ha)	Depth of mineralization	Geological resource (mcm)	Whether virgin or partially excavated	Nature of land (whether free for mining/ forest / agriculture)	Mineral reserve (approx) mentioning grade	Administrative block	Co-ordinate		Infra structure available near the mineralized zone
	PB_QT_ZONE_1		Granite Gneiss	233.27			Partialy Excavated		Partially explored		23° 47' 23.070" N	86° 53' 44.533" E	Road network available
											23° 46' 57.053" N	86° 53' 49.313" E	
											23° 46' 46.339" N	86° 52' 25.795" E	
											23° 47' 16.858" N	86° 52' 23.916" E	
											23° 47' 31.759" N	86° 52' 22.764" E	
											23° 47' 33.148" N	86° 52' 38.471" E	

NOTE: In-situ Minerals Occurrences table also given as Annexure 5.
 # Geological resources given in the table is tentative and determination of actual resources need geological exploration in the means of mapping, drilling etc.

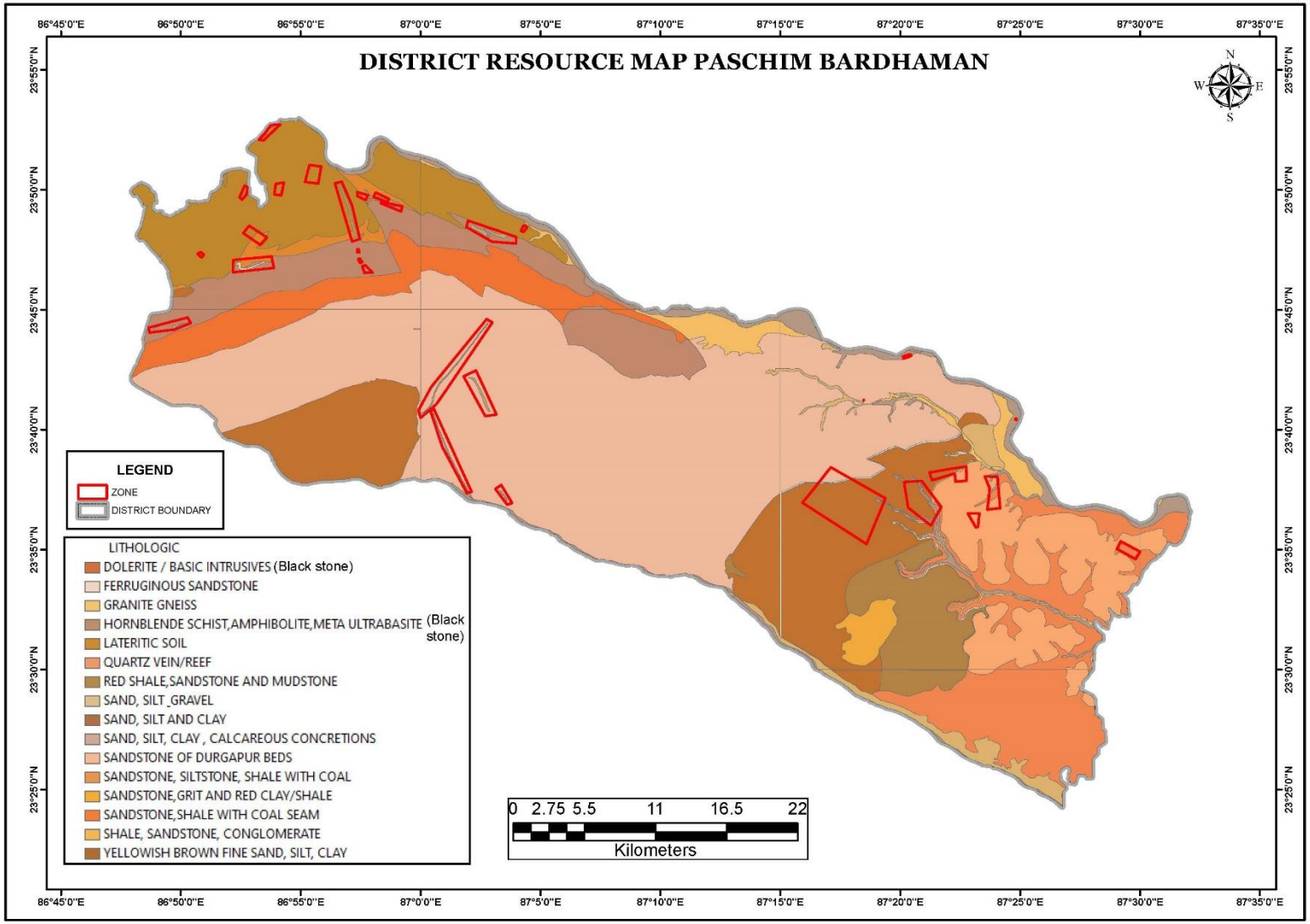


Figure 11.1: Existing mining leases of In-situ minerals along with In-situ mineral occurrences shown on geological map of Paschim Bardhaman District

11.3 Mineral development prospect of the district with respect to Minor Mineral

The district has good prospects of major mineral resources. Mining of coal is generating a considerable amount of revenue for the district. China clay deposits are holding the next potential resources in terms of revenue generation. Existing insitu minor mineral leases of the district tabulated below.

Table 11.2: List of existing mining leases of the district (other than sand)
Office of Chief Mining Officer, Asansol

Sl. No.	Block	Minerals	Name of Mouza (JL No)	Plot No	Area in Acres	Name of the holder	LATITUDE	LONGITUDE
1	Barabani	Dolerite Dyke	Amdiha (24)	115, 117, 118, 119	4.48	Sanjay Kumar	23° 47' 30.7000" N	86° 57' 24.5000" E
							23° 47' 30.4000" N	86° 57' 22.6000" E
							23° 47' 26.5000" N	86° 57' 23.4000" E
							23° 47' 23.2000" N	86° 57' 22.5000" E
							23° 47' 24.0000" N	86° 57' 25.9000" E
							23° 47' 26.8000" N	86° 57' 25.4000" E
2	Barabani	Dolerite Dyke	Baliapur (25)	776	3.50	Ujjal Das	23° 46' 34.7000" N	86° 57' 45.5500" E
							23° 46' 38.2300" N	86° 57' 45.4600" E
							23° 46' 40.1400" N	86° 57' 45.0400" E
							23° 46' 43.6500" N	86° 57' 41.8100" E
							23° 46' 44.8300" N	86° 57' 42.2200" E
							23° 46' 43.8100" N	86° 57' 44.0000" E
							23° 46' 35.4000" N	86° 57' 49.9700" E
							23° 46' 34.8300" N	86° 57' 51.2100" E
							23° 46' 34.1400" N	86° 57' 51.1100" E
3	Barabani	Dolerite Dyke	Amdiha (24)	381, 382	5.19	M/s Shiv Shakti Mines & Minerals Dipak Kumar Maji	23° 47' 06.1584" N	86° 57' 27.2520" E
							23° 47' 06.5472" N	86° 57' 26.5176" E
							23° 47' 02.0364" N	86° 57' 26.8344" E
							23° 46' 58.2852" N	86° 57' 28.7136" E
							23° 46' 59.0808" N	86° 57' 32.9832" E
							23° 47' 00.3336" N	86° 57' 31.8924" E
							23° 46' 59.9448" N	86° 57' 30.1608" E
4	Salanpur	Granite	Maheshpur (24)	83	2.75	M/s Maa Kali Stone Quarry Arup Kumar Mandal	23° 47' 18.6300" N	86° 50' 44.4300" E
							23° 47' 17.6400" N	86° 50' 49.8200" E
							23° 47' 13.4100" N	86° 50' 51.1000" E
							23° 47' 14.5400" N	86° 50' 47.7400" E
							23° 47' 15.7200" N	86° 50' 48.0700" E
							23° 47' 15.7600" N	86° 50' 48.4300" E
							23° 47' 16.3500" N	86° 50' 48.8800" E
5	Barabani	Granite	Baliapur (25)	1215, 1217, 1219	3.34	Cemix Structural Private Limited Sri Subrata Bharadwaj	23° 50' 12.0000" N	86° 54' 00.0000" E
							23° 49' 48.6000" N	86° 54' 10.0000" E
							23° 50' 10.5000" N	86° 54' 12.0000" E
							23° 50' 13.2000" N	86° 54' 13.0000" E
							23° 50' 14.0000" N	86° 54' 14.0000" E
							23° 50' 15.0000" N	86° 54' 15.0000" E
							23° 49' 49.0000" N	86° 53' 58.0000" E
							23° 49' 52.0000" N	86° 53' 59.0000" E
							23° 49' 54.0000" N	86° 53' 57.0000" E
							23° 50' 13.5000" N	86° 54' 11.0000" E

Sl. No.	Block	Minerals	Name of Mouza (JL No)	Plot No	Area in Acres	Name of the holder	LATITUDE	LONGITUDE
6	Faridpur	Gravel	Bansgora (38)	1 to 500	1199.19	Sujit Biswas and Subir Biswas	23° 37' 15.7730" N	87° 18' 55.9300" E
							23° 36' 18.1830" N	87° 18' 32.8140" E
							23° 37' 36.3210" N	87° 17' 00.6060" E
							23° 37' 53.2940" N	87° 17' 04.2370" E
7	Jamuria	Black stone	Baguli (02)	20	7.39	Chinmoy Mondal	23° 48' 28.0800" N	87° 04' 17.2900" E
							23° 48' 29.3800" N	87° 04' 19.3800" E
							23° 48' 29.5900" N	87° 04' 20.0600" E
							23° 48' 29.4100" N	87° 04' 21.2900" E
							23° 48' 28.9400" N	87° 04' 21.9700" E
							23° 48' 28.5800" N	87° 04' 22.8400" E
							23° 48' 28.0800" N	87° 04' 22.5100" E
							23° 48' 26.5300" N	87° 04' 24.8500" E
							23° 48' 27.0000" N	87° 04' 25.1400" E
							23° 48' 26.8200" N	87° 04' 25.4600" E
							23° 48' 26.4600" N	87° 04' 25.7900" E
							23° 48' 25.7400" N	87° 04' 25.6100" E
							23° 48' 25.5600" N	87° 04' 25.7500" E
							23° 48' 24.9800" N	87° 04' 25.8200" E
							23° 48' 24.1200" N	87° 04' 24.3800" E
							23° 48' 23.4700" N	87° 04' 23.4800" E
							23° 48' 23.4700" N	87° 04' 22.7300" E
							23° 48' 24.0500" N	87° 04' 21.0400" E
							23° 48' 24.0800" N	87° 04' 20.3200" E
							23° 48' 24.2300" N	87° 04' 19.9600" E
							23° 48' 24.3000" N	87° 04' 19.1600" E
							23° 48' 24.4400" N	87° 04' 18.6200" E
							23° 48' 26.2800" N	87° 04' 17.5100" E

12 Remedial measure to mitigate the impact of mining

12.1 Environmental Sensitivity

Paschim Bardhaman area represents a unique geo- environmental setup. As human population increases, forests are being depleted for the extension of agricultural lands, introduction of new settlements, roadways etc

Due to unprecedented growth of population during the last few decades, nature has started reacting sharply to the accumulated human guilt. Soil erosion and its conservation play an important role.

The land use practices play the most important role in determining the stability factors in respect of landslide hazards. Stone quarrying from the slope is another way of human intervention that causes occasional slope failure.

12.2 Sand mining Impact

Another serious environmental problem around the globe in recent years is of sand and gravel mining. Sand mining is a process of extraction of sand from an open pit, river bed, sea beaches, ocean floor, river banks, deltas and island dunes. The extracted sand could be utilised for various types of manufacturing, such as concrete used in the construction of building and other structures. The sand can also be used as an abrasive. The demand for sand will increase with population growth and urbanization. The high demand of sand has has led to unsustainable sand mining process resulting in illegal mining.

Although most jurisdictions have legal limit on the location and volume of sand that can be mined, illegal sand extraction is taking place in many parts of the country due to rapid urbanisation and industrialisation.

Removal or extraction of too much sand from rivers leads to erosion of river banks. Deltas can recede due to sand mining. These destructive effects of sand mining ultimately results in loss of fertile land and property. It also destabilizes the ground and causes failure of engineering structures.

In-stream mining directly alters the channel geometry and bed elevation. Removing sediment from the channel disrupts the pre-existing balance between sediment supply and transporting capacity, typically inducing incision upstream and downstream of the extraction site. The resultant incision alters the frequency of floodplain inundation along the river courses, lowers valley floor water table and frequently leads to destruction of bridges and channelization structures.

Sand Mining in beaches disturbs the ecosystem of different fauna of the beaches. The sand mining from natural barriers, made up of sand, causes flooding of the natural habitat. The sand

mining activity destroys the aesthetic beauty of beaches and river bank and makes the ecosystem unstable. If there are popular tourist destination, tourism potential of such areas will decline.

It can be concluded that there has been little in depth research on the environmental, social and political effects of land use practices and calls for urgent attention by the competent authority.

12.3 Remedial measure

12.3.1 Sustainable Mining Practices:

- The depth of mining in riverbed shall not exceed 3 meter or base flow level whichever is less, provided that where the Joint Inspection Committee certifies about excessive deposit or over accumulation of mineral in certain reaches requiring channelization, it can go above 3 meters.
- Mining shall be done in layers of 1 meter depth to avoid ponding effect and after first layer is excavated, the process will be repeated for the next layers.
- No stream should be diverted for the purpose of sand mining. No natural water course and/ or water resources are obstructed due to mining operations.
- No blasting shall be resorted to in river mining and without permission at any other place.

12.3.2 Monitoring the Mining of Mineral and its Transportation:

- For each mining lease site the access should be controlled in a way that vehicles carrying mineral from that area are tracked and accounted for.
- There should be regular monitoring of the mining activities in the State to ensure effective compliance of stipulated EC conditions and of the provisions under the Minor Mineral Concessions Rules framed by the State Government.

12.3.3 Noise Management:

- Noise arising out of mining and processing shall be abated and controlled at source to keep within permissible limit.
- Restricted sand mining operation has to be carried out between 6 am to 7 pm.

12.3.4 Air Pollution and Dust Management:

- The pollution due to transportation load on the environment will be effectively controlled and water sprinkling will also be done regularly.
- Air pollution due to dust, exhaust emission or fumes during mining and processing phase should be controlled and kept in permissible limits specified under environmental laws.

- The mineral transportation shall be carried out through covered trucks only and the vehicles carrying the mineral shall not be overloaded. Wheel washing facility should be installed and used.

12.3.5Bio-Diversity Protection:

- Restoration of flora affected by mining should be done immediately. Five times the number of trees destroyed by mining to be planted preferably of indigenous species. Each EC holder shall have to undertake plantation of trees over at least 20% of the total area of lease in the same plot or plots utilised for such working.
- No mining lease shall be granted in the forest area without forest clearance in accordance with the provisions of the Forest Conservation Act, 1980 and the rules made there under.
- Protection of natural home of any wild animal shall have to be ensured.
- No felling of tree near quarry is allowed. For mining lease within 10km of the National Park / Sanctuary or in Eco-Sensitive Zone of the Protected Area, recommendation of Standing Committee of National Board of Wild Life (NBWL) have to be obtained as per the Hon'ble Supreme Court order in I.A. No. 460 of 2004.
- Spring sources should not be affected due to mining activities. Necessary protection measures are to be incorporated.

12.3.6 Management of Instability and Erosion:

- Removal, stacking and utilization of top soil should be ensured during mining. Where top soil cannot be used concurrently, it shall be stored separately for future use keeping in view that the bacterial organism should not die and should be spread nearby area.
- The EC should stipulate conditions for adequate steps to check soil erosion and control debris flow etc. by constructing engineering structures
- Use of oversize material to control erosion and movement of sediments
- No overhangs shall be allowed to be formed due to mining and mining shall not be allowed in area where subsidence of rocks is likely to occur due to steep angle of slope.
- No extraction of stone / boulder / sand in landslide prone areas.
- Controlled clearance of riparian vegetation to be undertaken.

12.3.7Waste Management:

- Site clearance and tidiness is very much needed to have less visual impact of mining.
- Dumping of waste shall be done in earmarked places as approved in Mining Plan.
- Rubbish burial shall not be done in the rivers.

12.3.8 Pollution Prevention:

- Take all possible precautions for the protection of environment and control of pollution.
- Effluent discharge should be kept to the minimum and it should meet the standards prescribed.

12.3.9 Protection of Infrastructure:

- Mining activities shall not be done for mine lease where mining can cause danger to site of flood protection works, places of cultural, religious, historical, and archeological importance.
- For carrying out mining in proximity to any bridge or embankment, appropriate safety zone should be worked out on case to case basis, taking into account the structural parameters, location aspects and flow rate, and no mining should be carried out in the safety zone so worked out.

Mining shall not be undertaken in a mining lease located in 300-500 meter of bridge, 300 meter upstream and downstream of water supply / irrigation scheme, 100 meters from the edge of National Highway and railway line, 50 meters from a reservoir, canal or building, 25 meter from the edge of State Highway and 10 meters from the edge of other roads except on special exemption by the Sub-Divisional level Joint Inspection Committee.

13 Suggested reclamation plan for already mined out areas

As per statute all mines/quarries are to be properly reclaimed before final closure of the mine. Reclamation plans should include:

a) A baseline survey of river cross section. The study of cross section is basis for delineating channel form. Cross-sections must be surveyed between two monumented endpoints set on the river banks, and elevations should be referenced based on benchmark set in the area;

b) The proposed mining cross-section data should be plotted over the baseline data to illustrate the vertical extent of the proposed excavation;

c) The cross-section of the replenished bar should be the same as the baseline data. This illustrates that the bar elevation after the bar is replenished will be the same as the bar before extraction;

d) A planimetric map showing the aerial extent of the excavation and extent of the riparian buffers;

e) A planting plan developed by a plant ecologist familiar with the flora of the river for any areas such as roads that need to be restored;

f) Each EC holder shall have to undertake plantation of trees over at least 20% of the total area of the plot or plots of land as subject to such working in accordance with a plan approved by the concerned Divisional Forest Officer holding jurisdiction, provided further the competent authority l.e, The Divisional Forest Officer may fix up norms for plantation of trees in a particular area regarding choice of species, spacing, nos of trees and maintenance etc.

g) A monitoring plan has to establish.

14 Risk assessment and disaster management plan

Risk analysis is the systematic study of risks encountered during various stages of mining operation. Risk analysis seek to identify the risks involved in mining operations, to understand how and when they arise, and estimate the impact (financial or otherwise) of adverse outcomes. The sand mining operation in the district is mainly done manually.

14.1 Identification of risk due to river sand mining

There is no land degradation due to mining activities as mining is done only on river bed dry surface. There will be no OB or waste generation as the sand is exposed in the river bed and is completely saleable. There will be neither any stacking of soil nor creation of OB dumps. The mining activity will carry out upto a maximum depth of 3m below the surface level. So, there is no chance of slope failure, bench failure in the mines. However, there are some identified risk in the mining activity which are as follows:

1. Accident during sand loading and transportation
2. Inundation/ Flooding
3. Quick Sand Condition

14.2 Mitigation measures

14.2.1 Measures to prevent accidents during loading and transportation:

- During the loading, trucks should be brought to a lower level so that the loading operation suits the ergonomic condition of the workers.
- The workers will be provided with gloves and safety shoes during loading.
- Opening of the side covers of the truck should be done carefully and with warning to prevent injury to the loaders.
- Mining operations will be done during daylight only.
- The truck will be covered with tarpaulin and maintained to prevent any spillage.
- To avoid danger while reversing the trackless vehicles especially at the embankment and tipping points, all areas for reversing of lorries should be made man free as far as possible.
- All transportation within the main working will be carried out directly under the supervision and control of the management.
- Overloading should not be permitted and the maximum permissible speed limit should be ensured.
- There will be regular maintenance of the trucks and the drivers will have valid driving license.

14.2.2 Measures to prevent incidents during Inundation/ Flooding:

To minimize the risk of flooding/ inundation following measures should be under taken:

- Mining will be completely closed during the monsoon months.
- Proper weather information particularly on rain should be kept during the operational period of mines so that precautionary measures will be undertaken.

14.2.3 Measures for mitigation to quick sand condition:

- Quick sand zone and deep-water zone will be clearly demarcated and all the mines workers will be made aware of the location.
- Mining will be done strictly as per the approved mining plan.

14.3 Disaster management plan

As the depth of mining will be maximum of 3m below the surface level considering local condition, the risk related to mining activity is much less. The mining operation will be carried out under the supervision of experienced and qualified Mines Manager having Certificate of Competency to manage the mines granted by DGMS. All the provisions of Mines Act 1952, MMR 1961 and Mines Rules 1955 and other laws applicable to mine will strictly be complied. During heavy rainfall and during the monsoon season the mining activities will be closed. Proper coordination with Irrigation Department should be maintained so that at the time of releasing water, if any, from the dam suitable warning/information is given in advance. Special attention and requisite precautions shall be taken while working in areas of geological weakness like existence of slip, fault etc. The mining site will be supplied with first aid facilities and the entire mines worker will have access to that.

15 Conclusions and Recommendations

The District Survey Report has been prepared in conformity with the S O 141 (E), S O 3611 (E) and other sand mining guidelines published by MoEF & CC time to time as well as the requirement specified in The WBMMCR, 2016.

Potential areas of economic mineralization and mineral deposition have been identified and list is furnished in the report. Estimation of annual sand deposition by replenishment study been incorporated.

The district survey report has been prepared by utilizing both primary and secondary data. The primary data generation involved the satellite imagery study, site inspection, survey, ground truthing etc. while secondary data has been acquired through various authenticated sources and satellite imagery studies.

The district survey report of Paschim Bardhaman district also describes the general geographical profile of the district, distribution of natural resources, livelihood, climatic condition and sources of revenue generation.

Paschim Bardhaman district is well known for its coal resources which belong to Raniganj and Barakar Formation of Gondwana super-group. The district in its western part is a continuation of Chotanagpur gneissic complex where as eastern part merged with the overlying Rajmahal trap. South-eastern part of the district merged with the margin Bengal Basin. The Gondwana seems to be occasionally traverse with the younger dykes which are potential sites development of stone aggregates. The margin between Chhotanagpur and Gondwana are often found to be clay bearing and are also linked with the potential economic mineral resources. Occurrences of lignite resources are also reported in the district as a part of younger Bengal Basin. A fairly good amount mono-mineralic gravel deposits is found to be spread over the Gondwana and is reported north-west of Durgapur city. A good stretch of morrum is found to be overlain the Gondwanas as well as the recent deposits of Bengal Basin. Atleast in few occurrences' quartzite deposits are also reported to be economically extracted.

Damodar and Ajay are the major two rivers defining the drainage of the district. Damodar River defines most of the southern boundary of the district while Ajay River defines the northern boundary shares with Birbhum district. However, only Ajay River found to be main resource of sand from Paschim Bardhaman district which is the source of construction sand fed the requirements of the state.

The district is generating considerable revenue from mining of minor minerals such as riverbed sand deposits. However, in-stream mining directly alters the channel geometry and bed elevation. Therefore, mining of riverbed should be carried out scientifically and based on statutory guidelines for conservation of land, river channels and sustainable development of the society.

15.1 Conclusion

I. The riverbeds of the district are enriched with sand which is highly potential for mining.

II. The replenishment study has been carried out during the preparation of this DSR. Both field-based surveys coupled with satellite imagery study and empirical studies were carried out to determine the rate of replenishment in each river of the district.

III. The determined values of various methods as adopted for replenishment study gives a comparable value and in all cases the values are found to be much more as compared to the capping limit (60%) as suggested in the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change (MoEF & CC) 2020.

IV. Field base study shows variation of replenishment from 97.40 to 98.90% in the district and for theoretical replenishment study based on mining lease shows variation from 74% to 78% with an average of 75.92% of replenishment rate in the district.

V. The total potential riverbed deposit for the district comes to about 16.72 Mcum.

VI. Thirty no.s of potential in-situ minor mineral zones have been identified.

15.2 Recommendation

1. The mining lease distribution for the district must be carried out by involving a district level committee constituted with inter-disciplinary members of various departments including irrigation and waterways, DL&LRO, forest, biodiversity, wetland management, SWID or any other relevant department which the district authority may find suitable to include.
2. While recommending for Mining Leases, the District Level Committee should ensure the protection of Biodiversity Zones as recorded by relevant Government Agenesis from time to time.
3. During finalization of mining leases for the district, strict adherence of Supreme Court orders No 1501 dated 03/06/2022 should be followed.
4. Efforts should be given to restrict distribution of mining leases along the confluence zone of the rivers where rich aquatic habitats are reported.
5. Since the state of West Bengal has royalty system in volumetric measurement, specific gravity for sand and gravel has not been determined during this study. However, during the finalization of mining lease if it is found necessary to conduct such test may be initiated by the state government on case-to-case basis.
6. It is recommended to have a periodical review along with primary data collection during pre- and post-monsoon periods to record the seasonal variance of the sedimentation rate on annual basis and update replenishment rate of the district.

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^ *"Ballavpur Paper Mnfg. Ltd". BPML. Retrieved 7 July 2018.*
^ a b *"Brief Industrial Profile of Burdwan district" (PDF). Micro Small and Medium Industries. Retrieved 13 April 2017.*
^ *"Bardhaman district". Industries. Bardhaman district administration. Retrieved 20 April 2017.*
^ *"Steel Authority of India". About Durgapur Steel Plant. SAIL. Archived from the original on 3 August 2017. Retrieved 4 March 2017.*
^ *"Damodar Valley Corporation". Reservoirs and Barrages. DVC. Retrieved 20 April 2017*

PLATE 1

DRAINAGE MAP OF THE DISTRICT

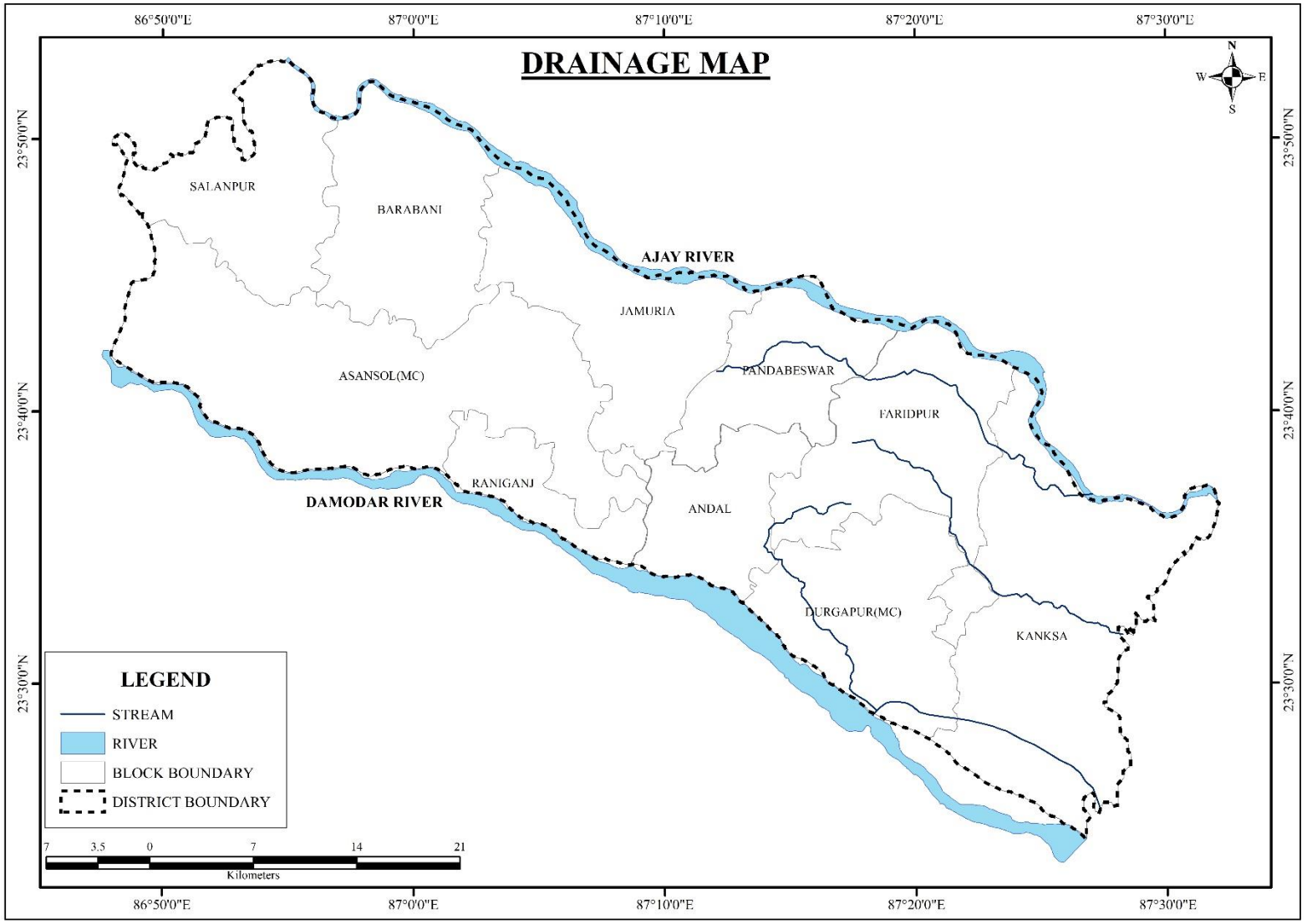


Plate 1A: Drainage Map of the District *(Source: National Informatics Centre -NIC Website, Sept 2020)*

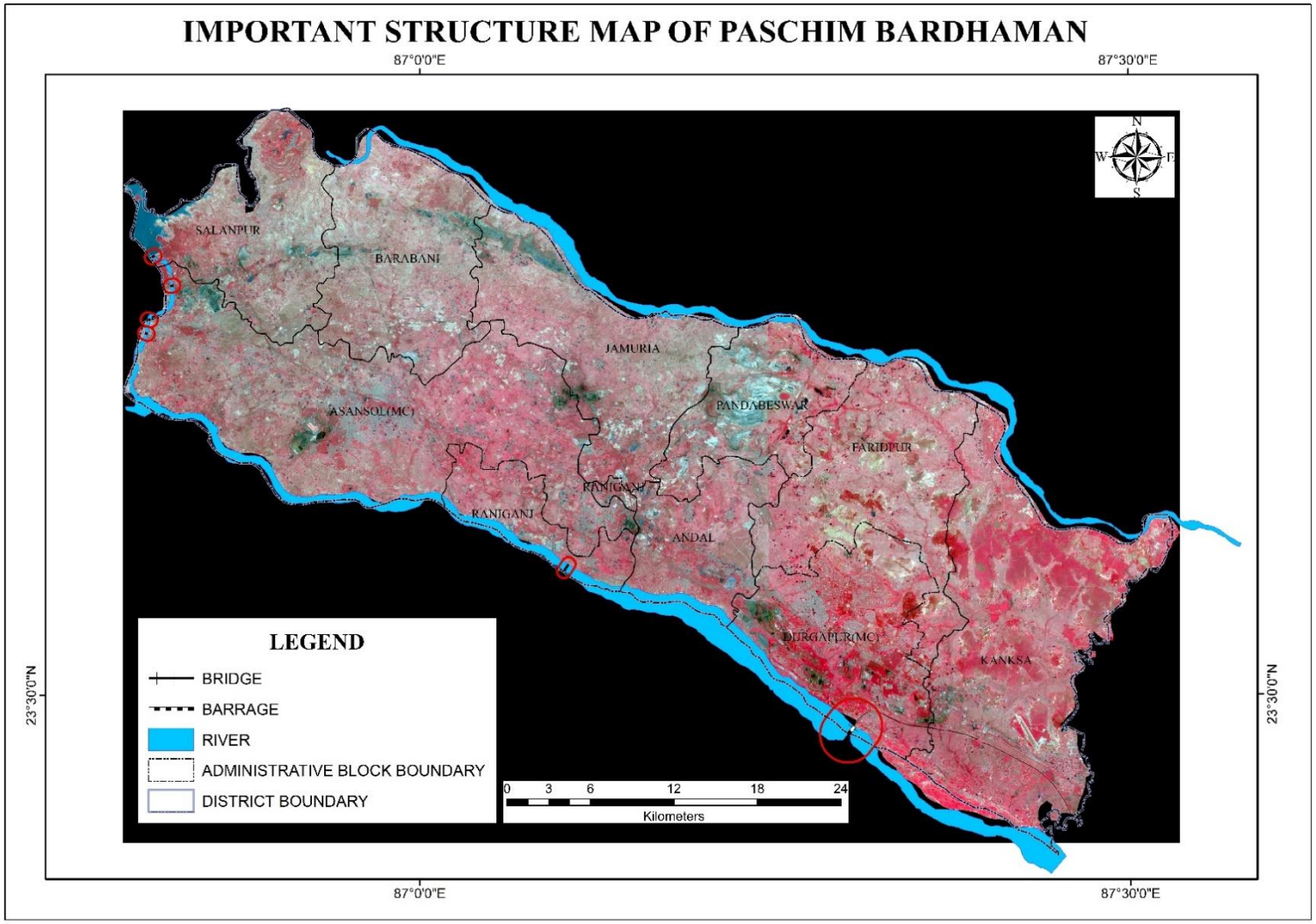


Plate No 1B: Location Map of dams, barrages, bridge showing on drainage system of the district*(Source: National Informatics Centre -NIC Website, Sept 2020)*

PLATE 2A

DISTRIBUTION MAP OF SAND BARS ON RIVERS DURING PRE-MONSOON PERIOD OF PASCHIM BARDHAMAN DISTRICT

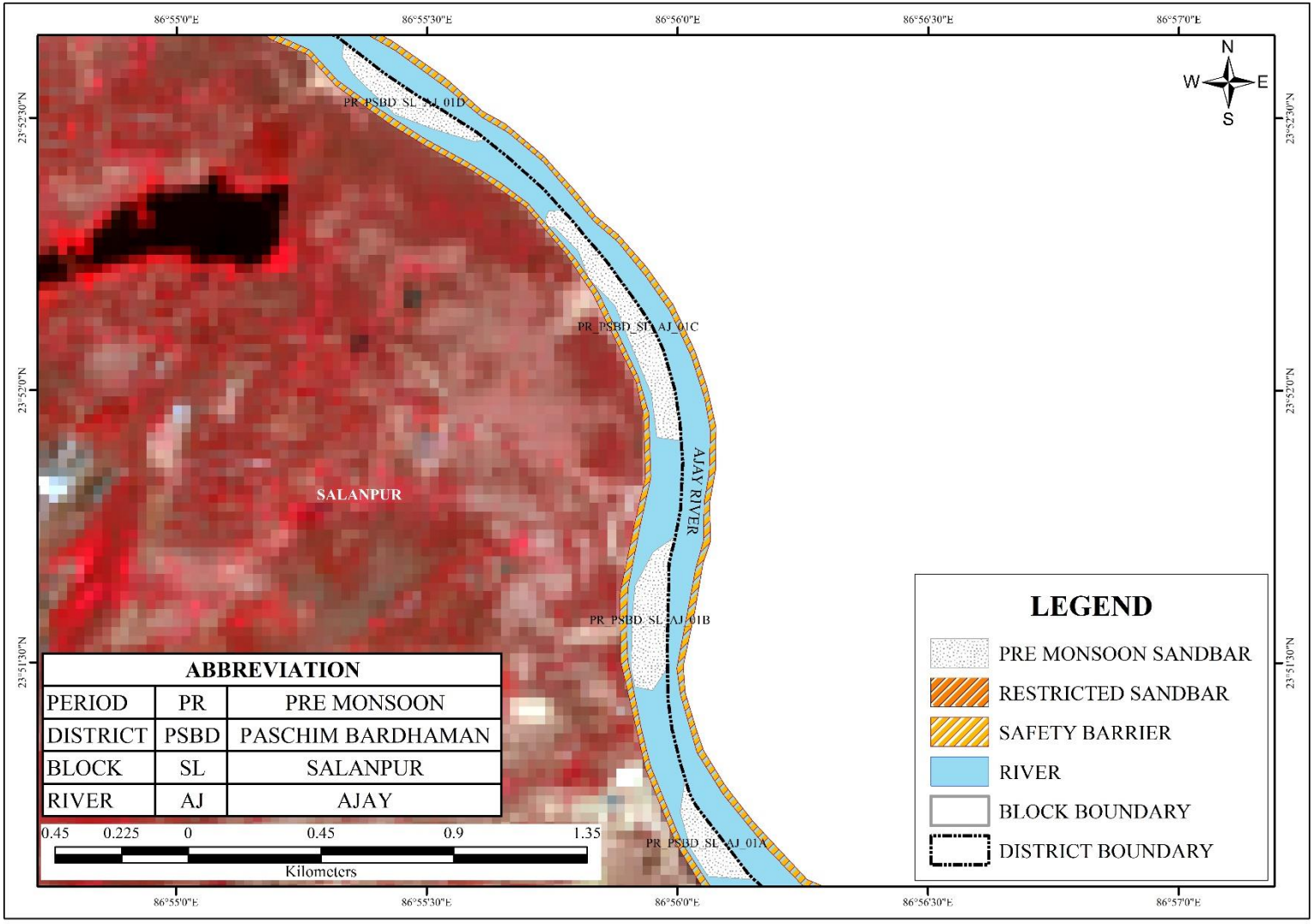


Plate 2A1: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

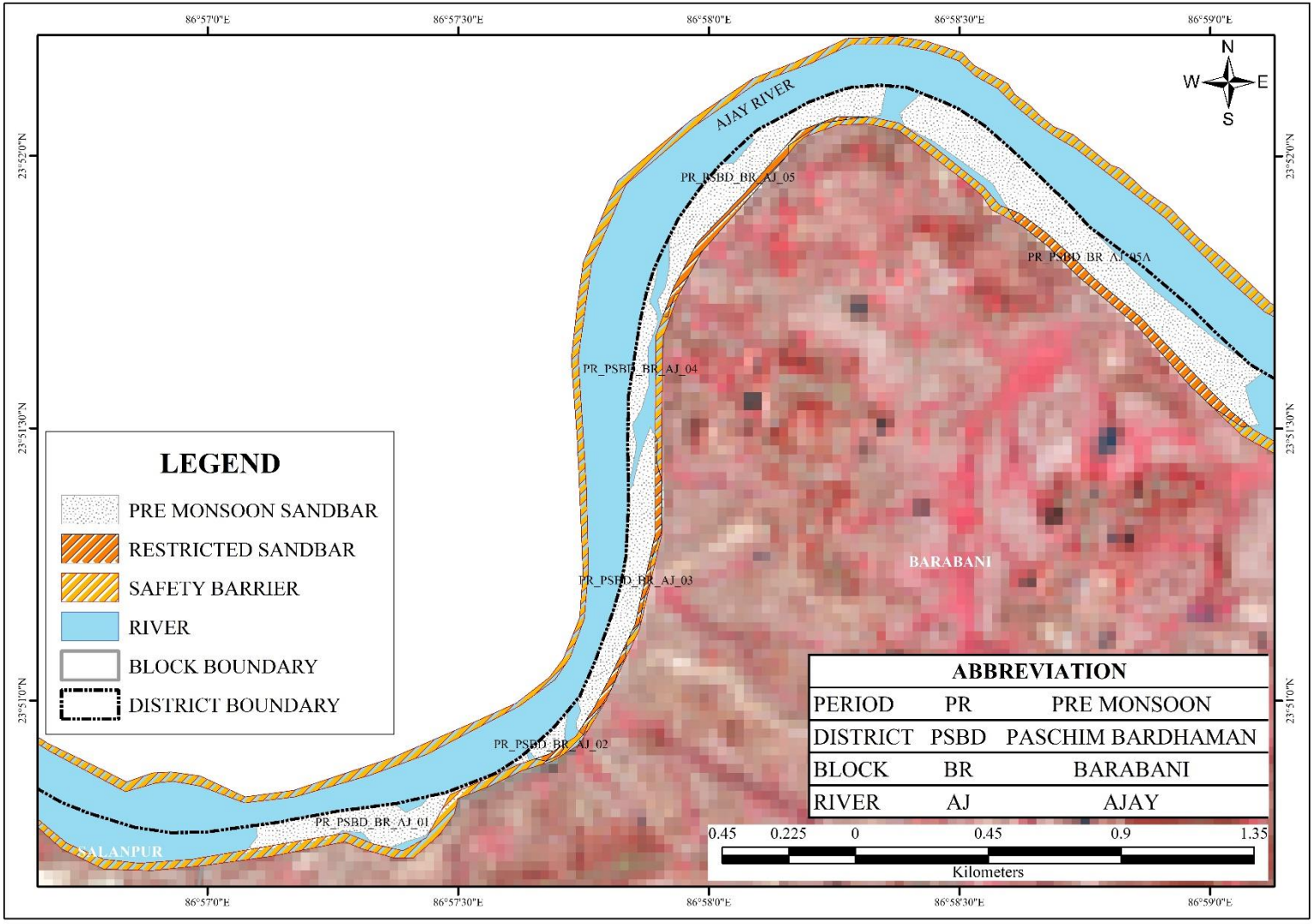


Plate 2A2: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

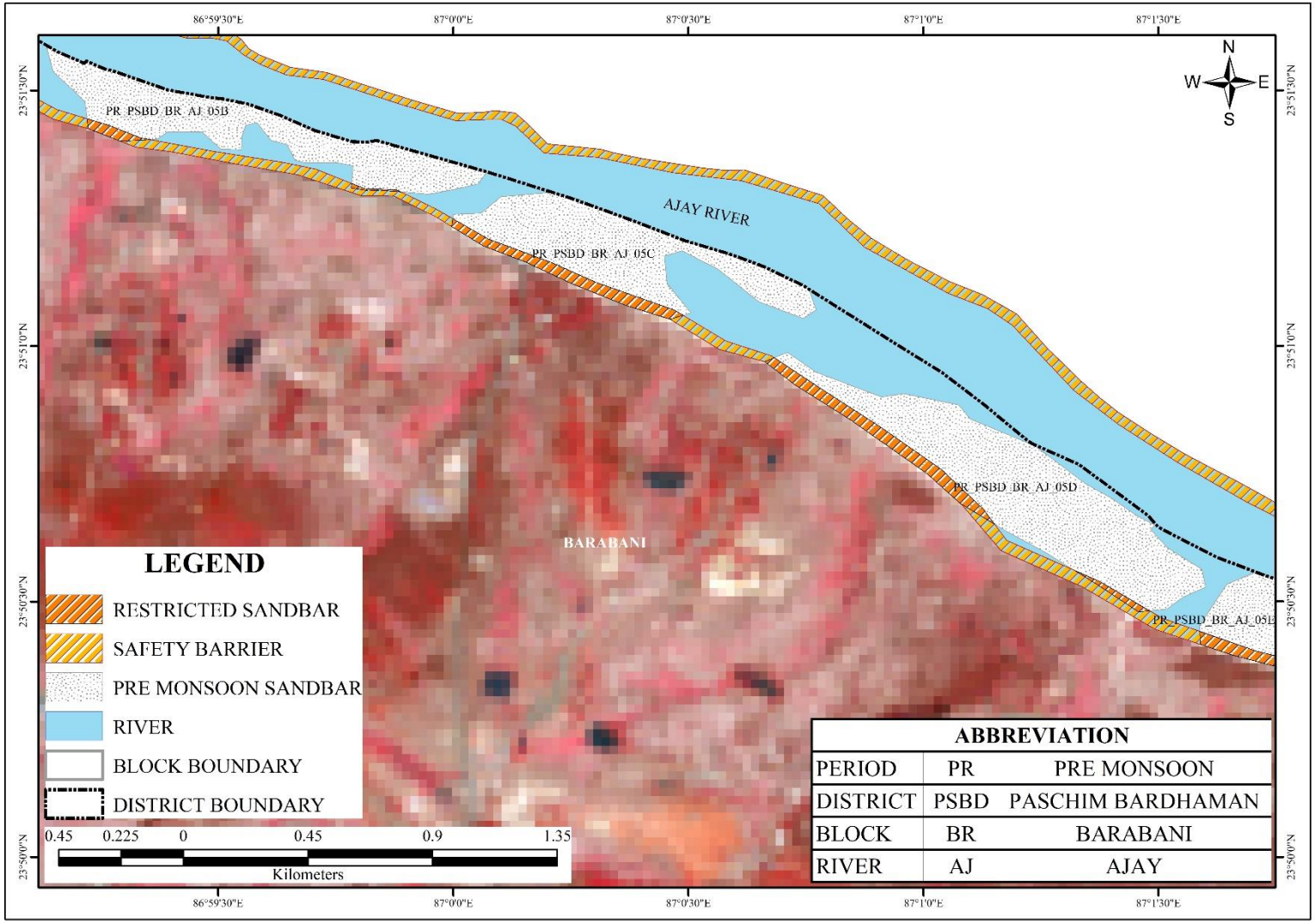


Plate 2A3: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

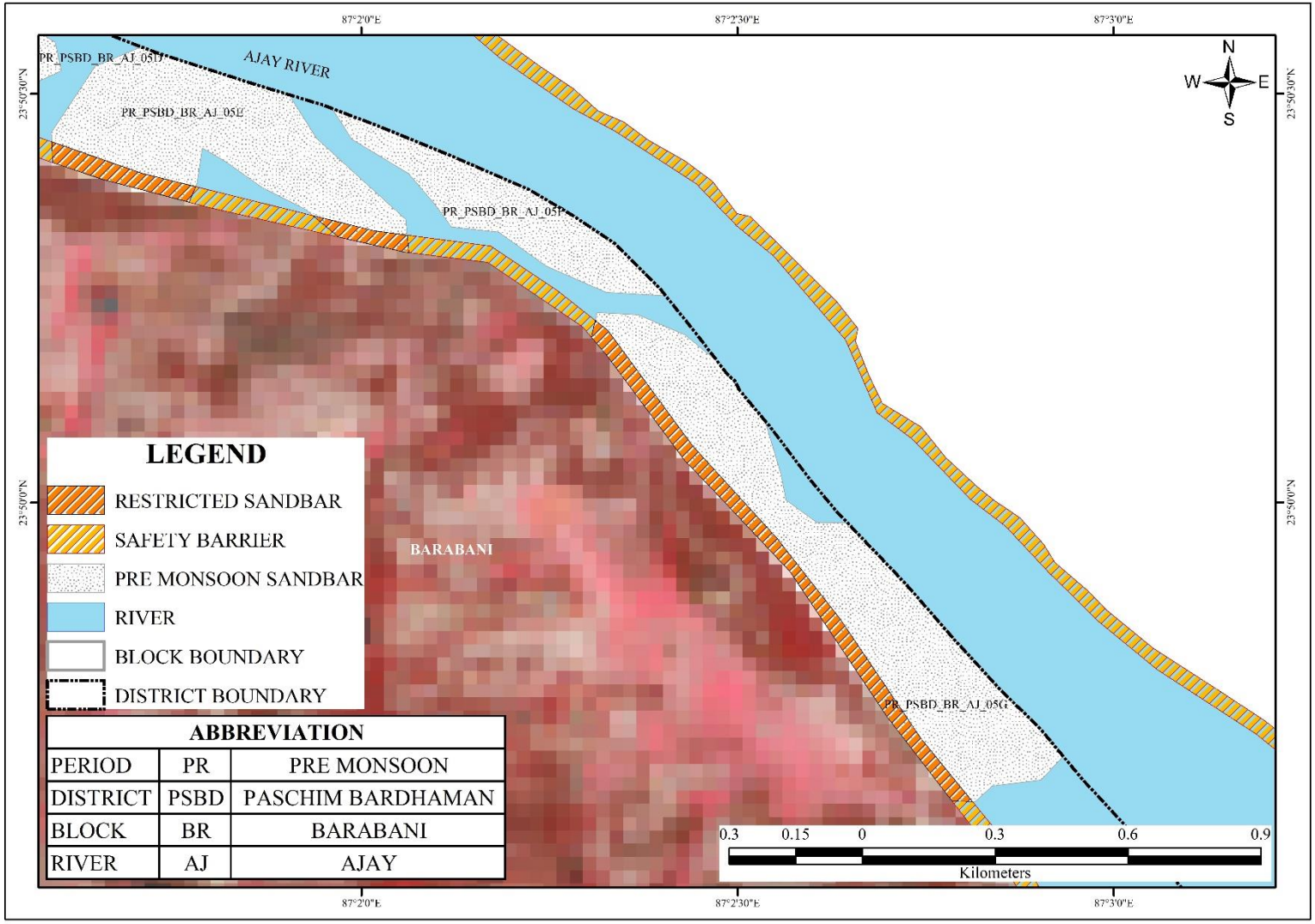


Plate 2A4: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

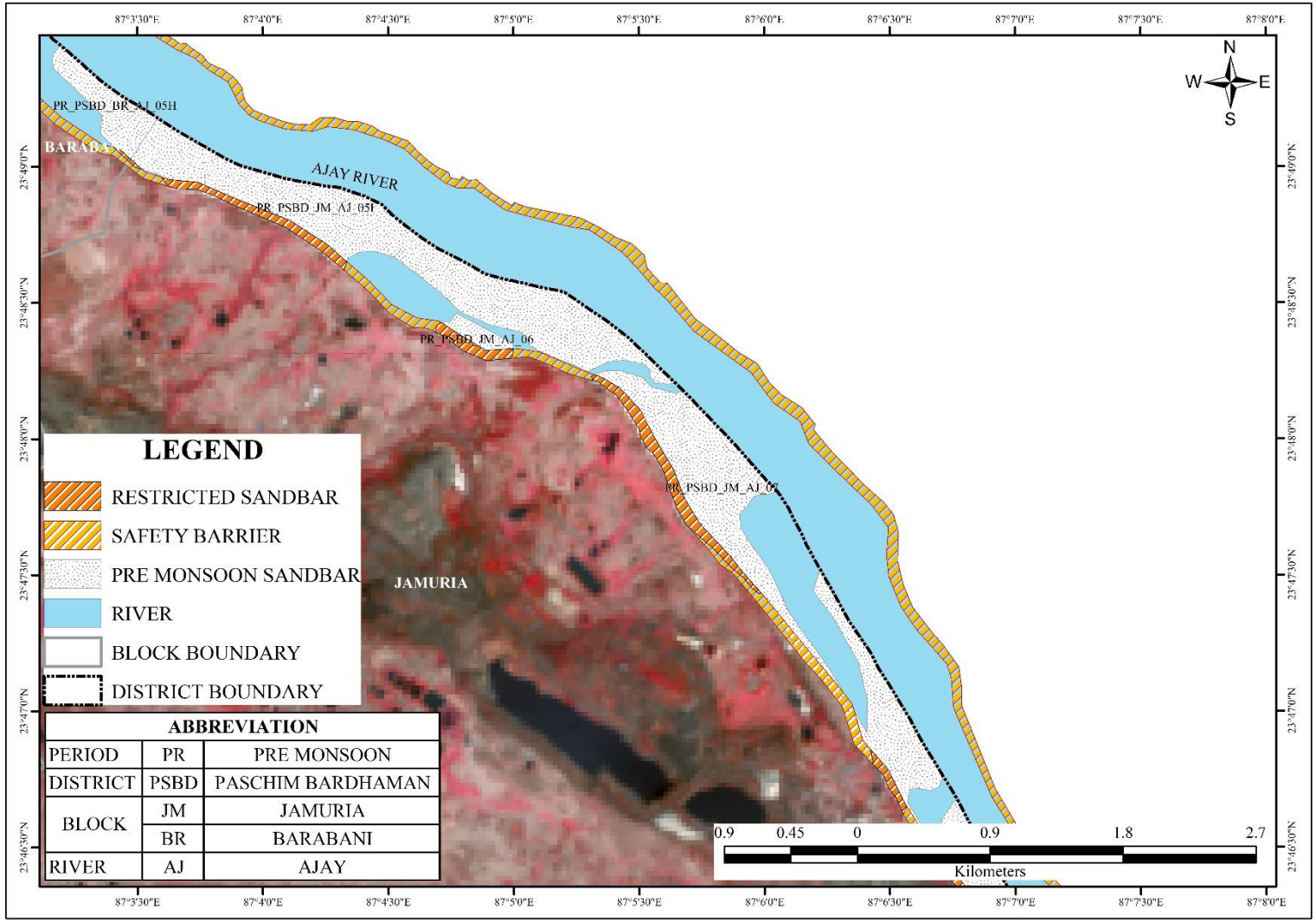


Plate 2A5: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

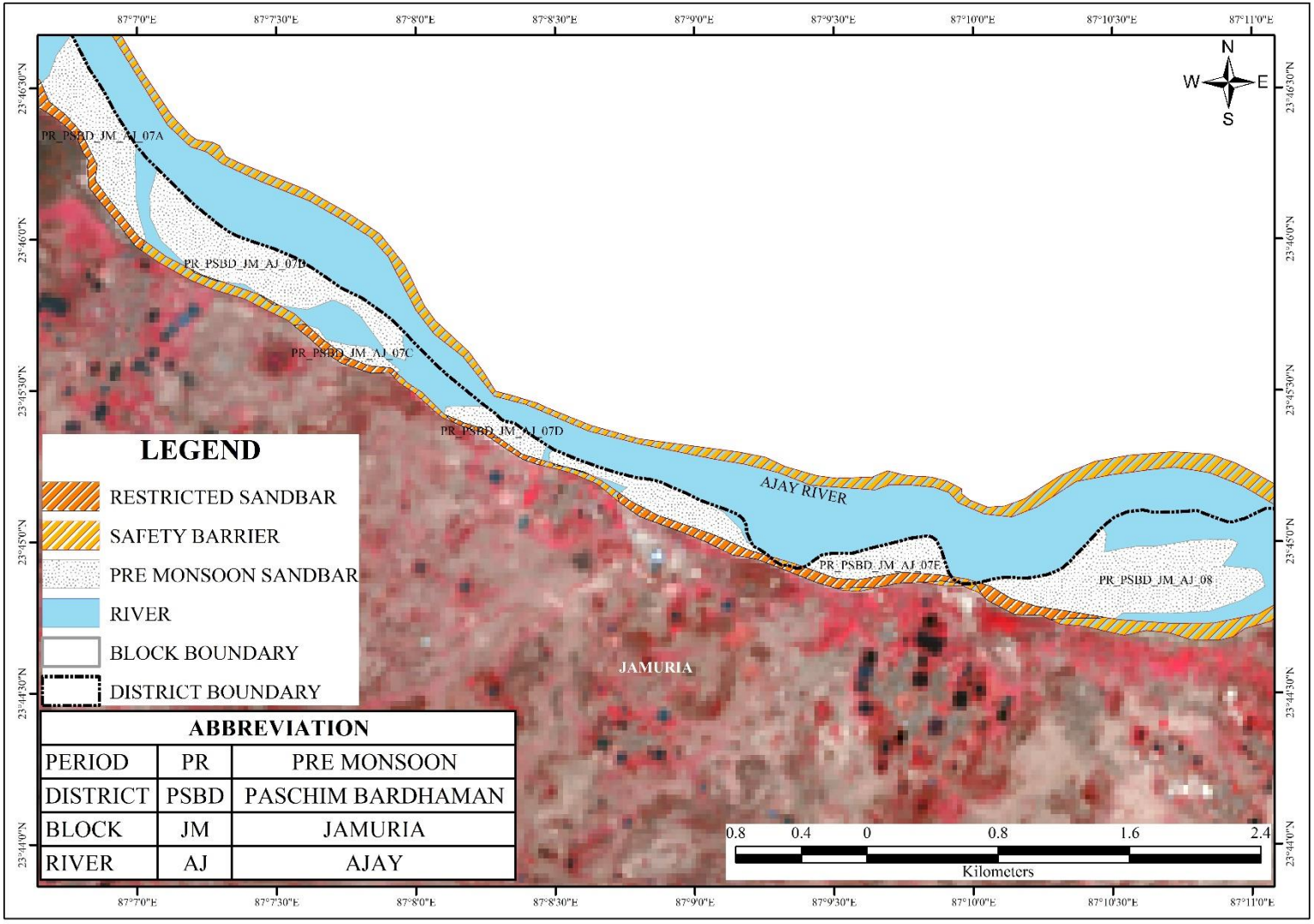


Plate 2A6: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

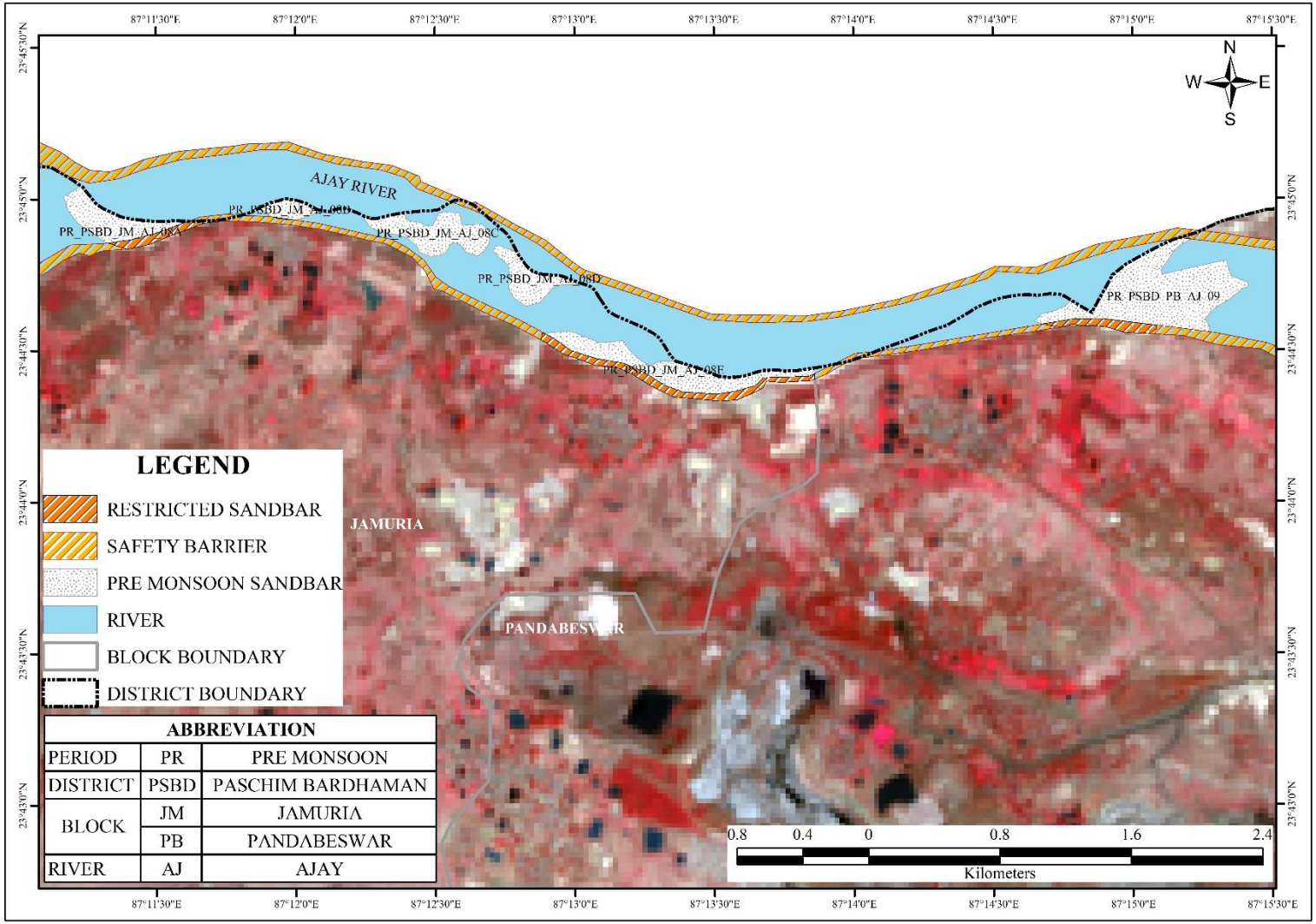


Plate 2A7: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

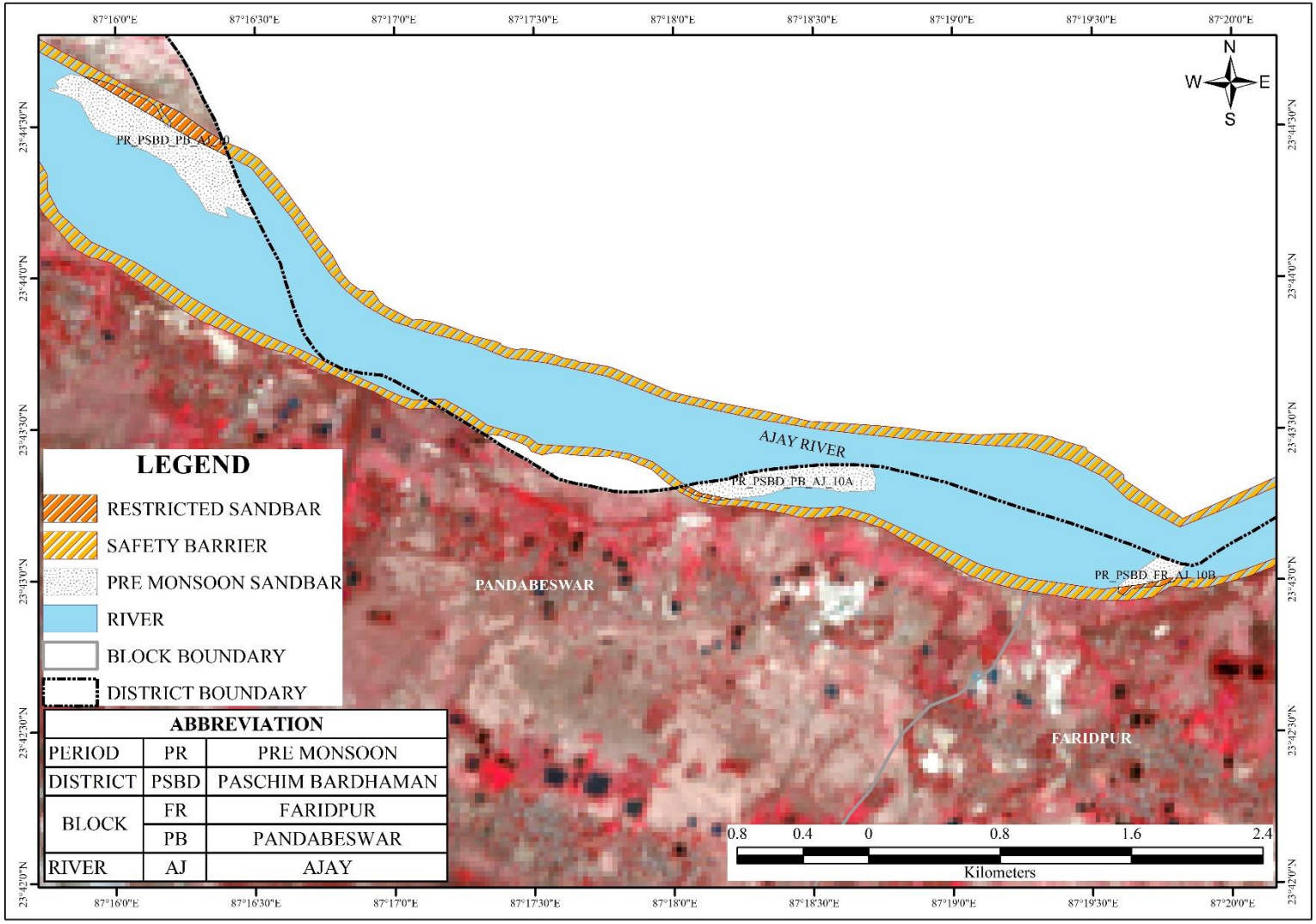


Plate 2A8: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

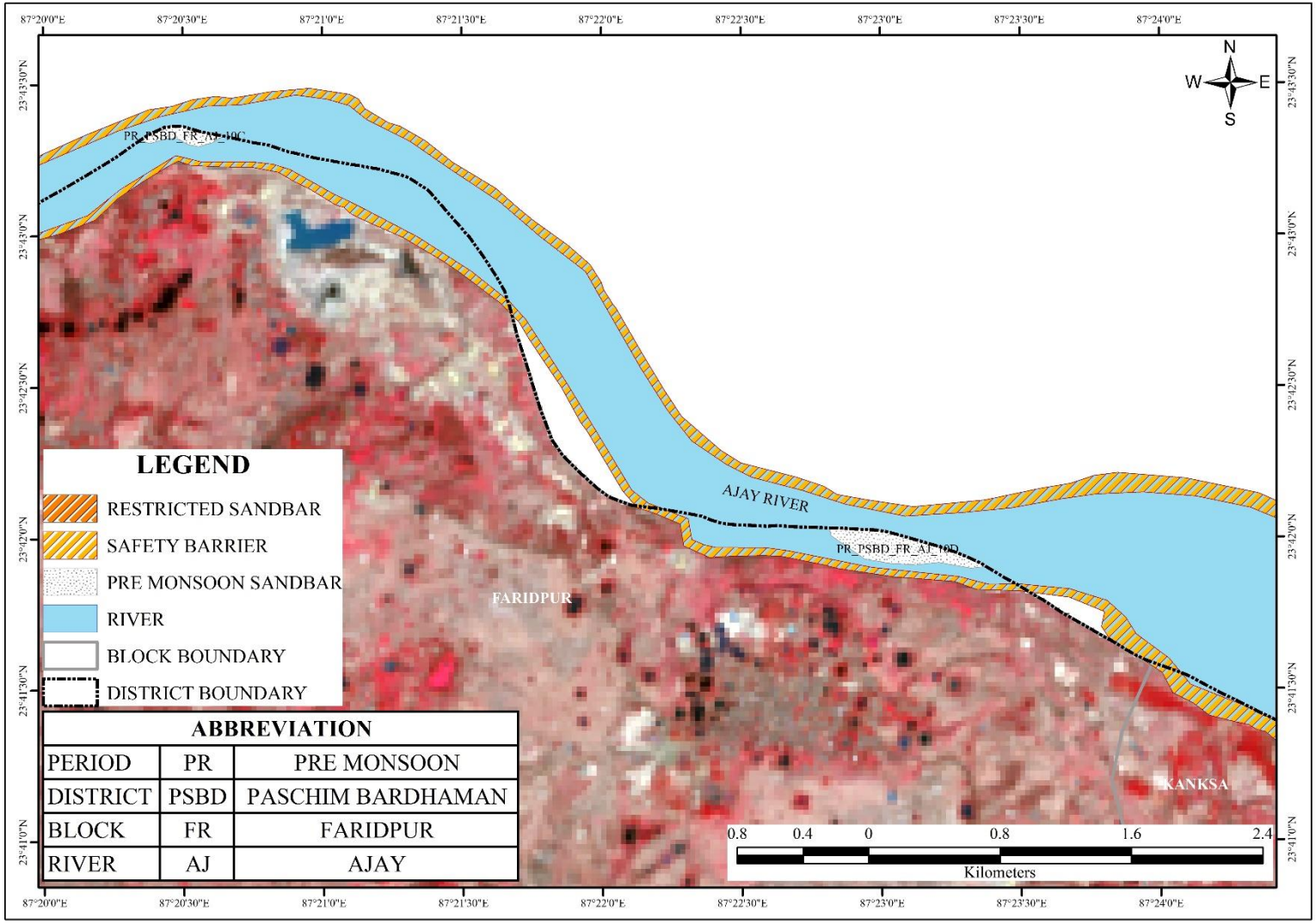


Plate 2A9: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

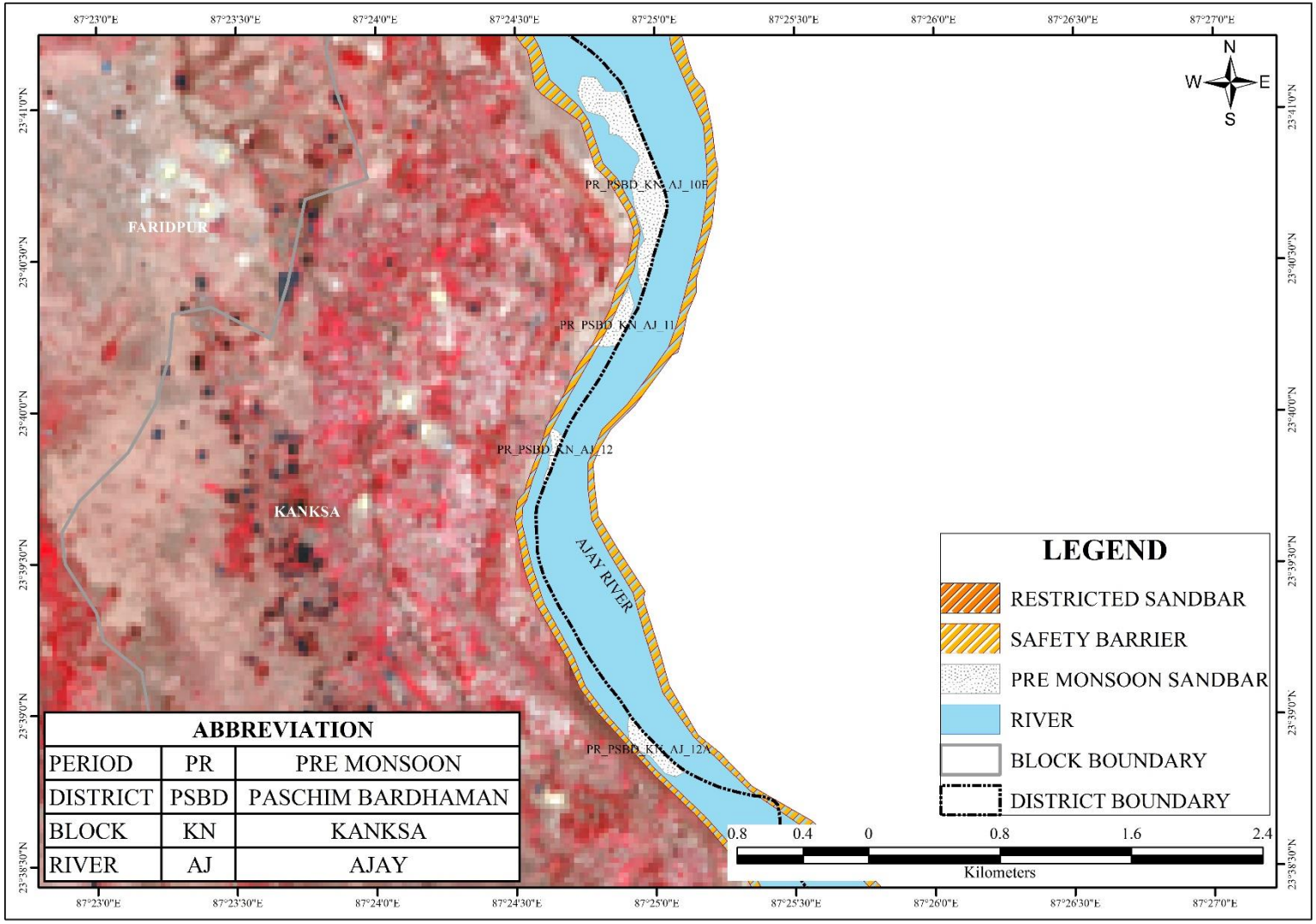


Plate 2A10: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

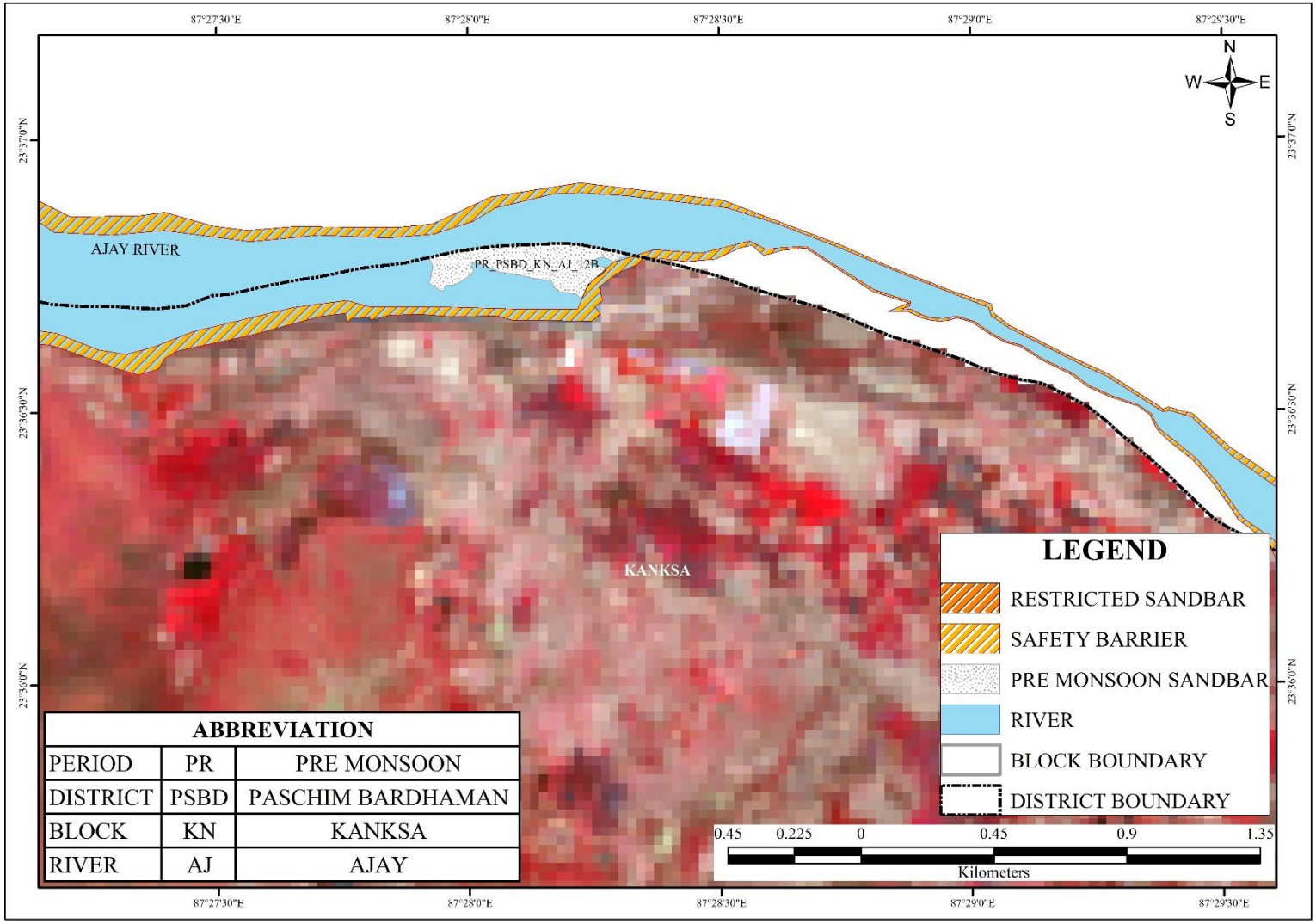


Plate 2A11: Distribution Map of Sand Bars on Ajay River During Pre-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March2020)*

PLATE 2B

DISTRIBUTION MAP OF SAND BARS ON RIVERS DURING POST-MONSOON PERIOD OF PASCHIM BARDHAMAN DISTRICT

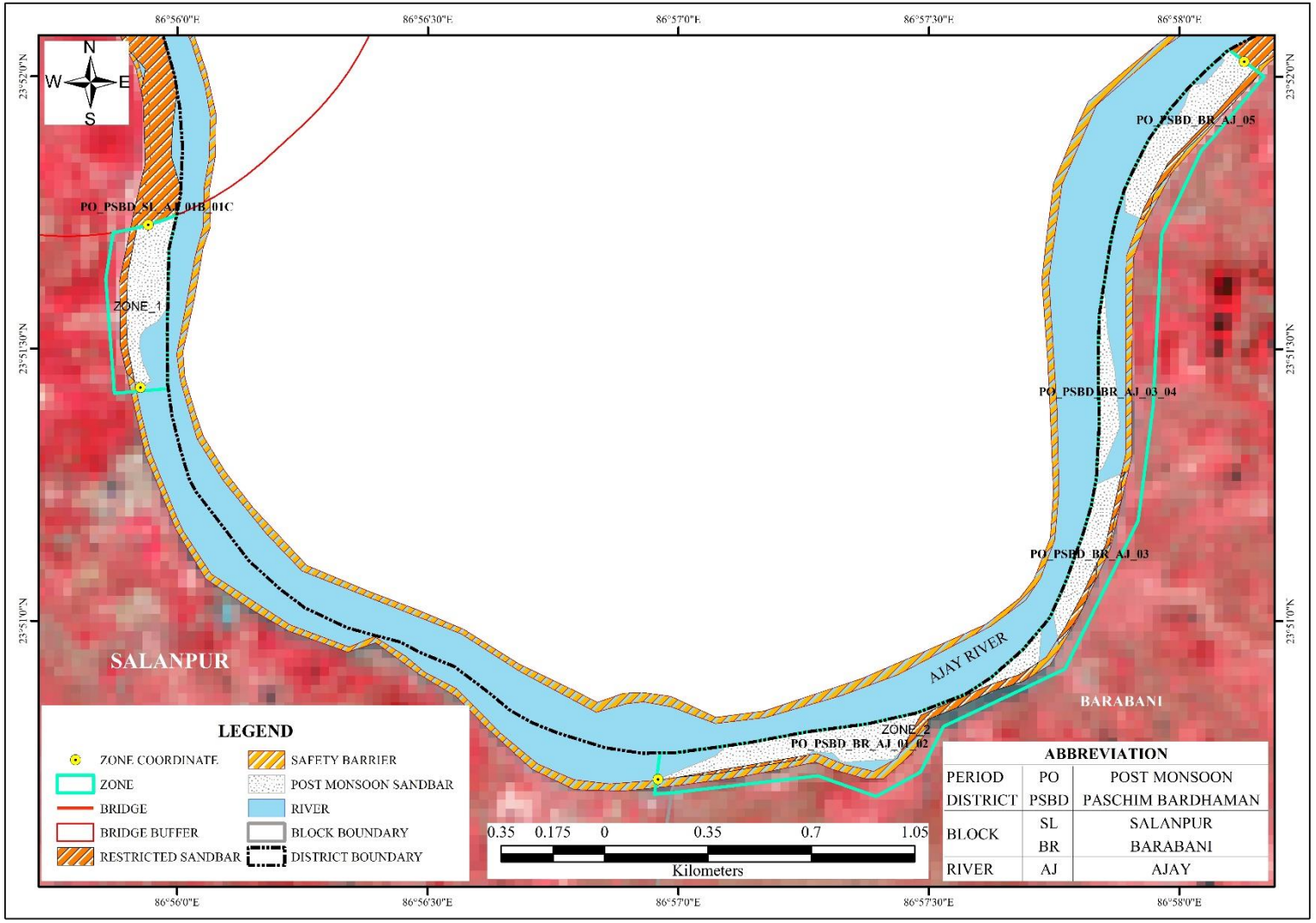


Plate 2B1: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

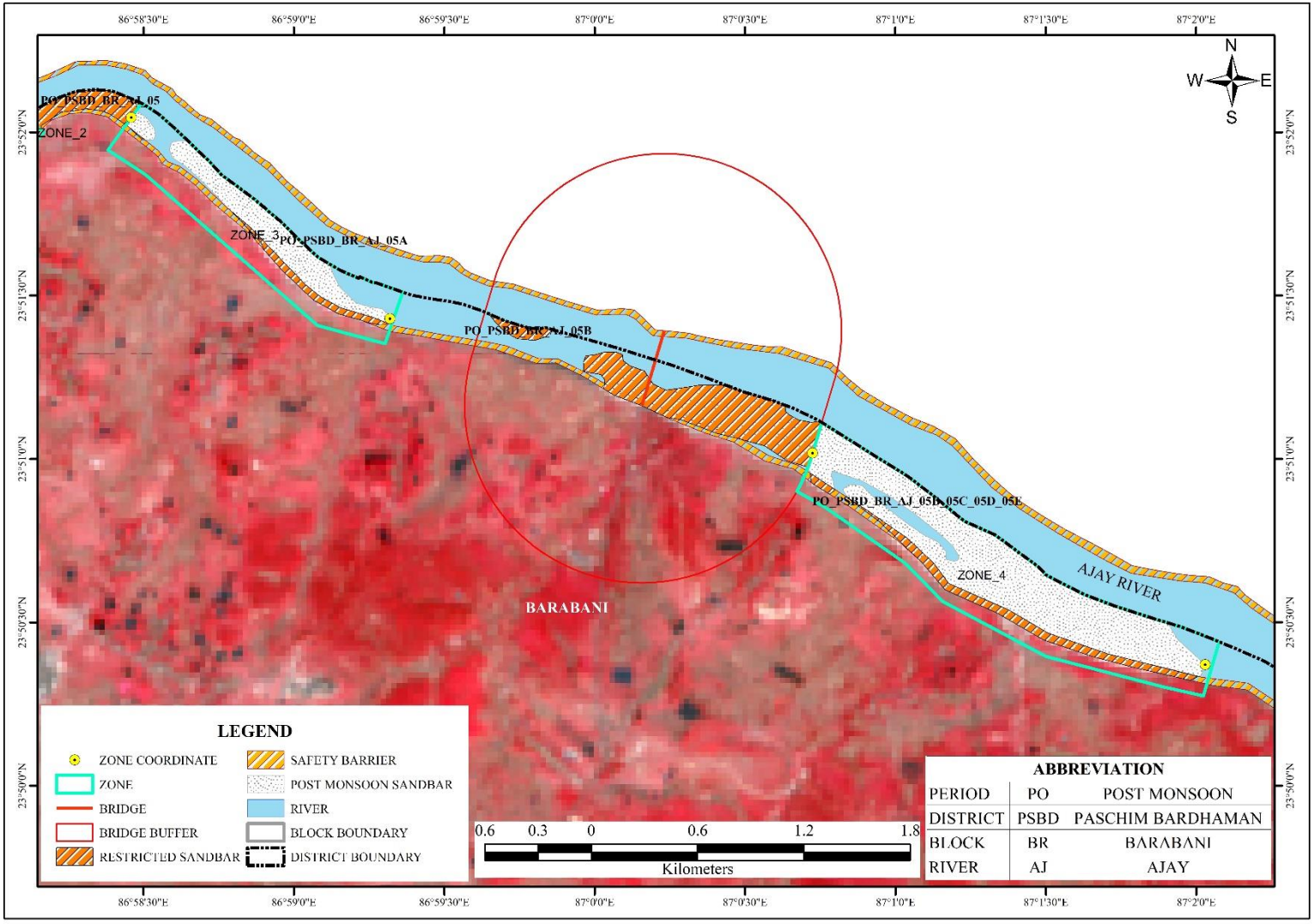


Plate 2B2: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

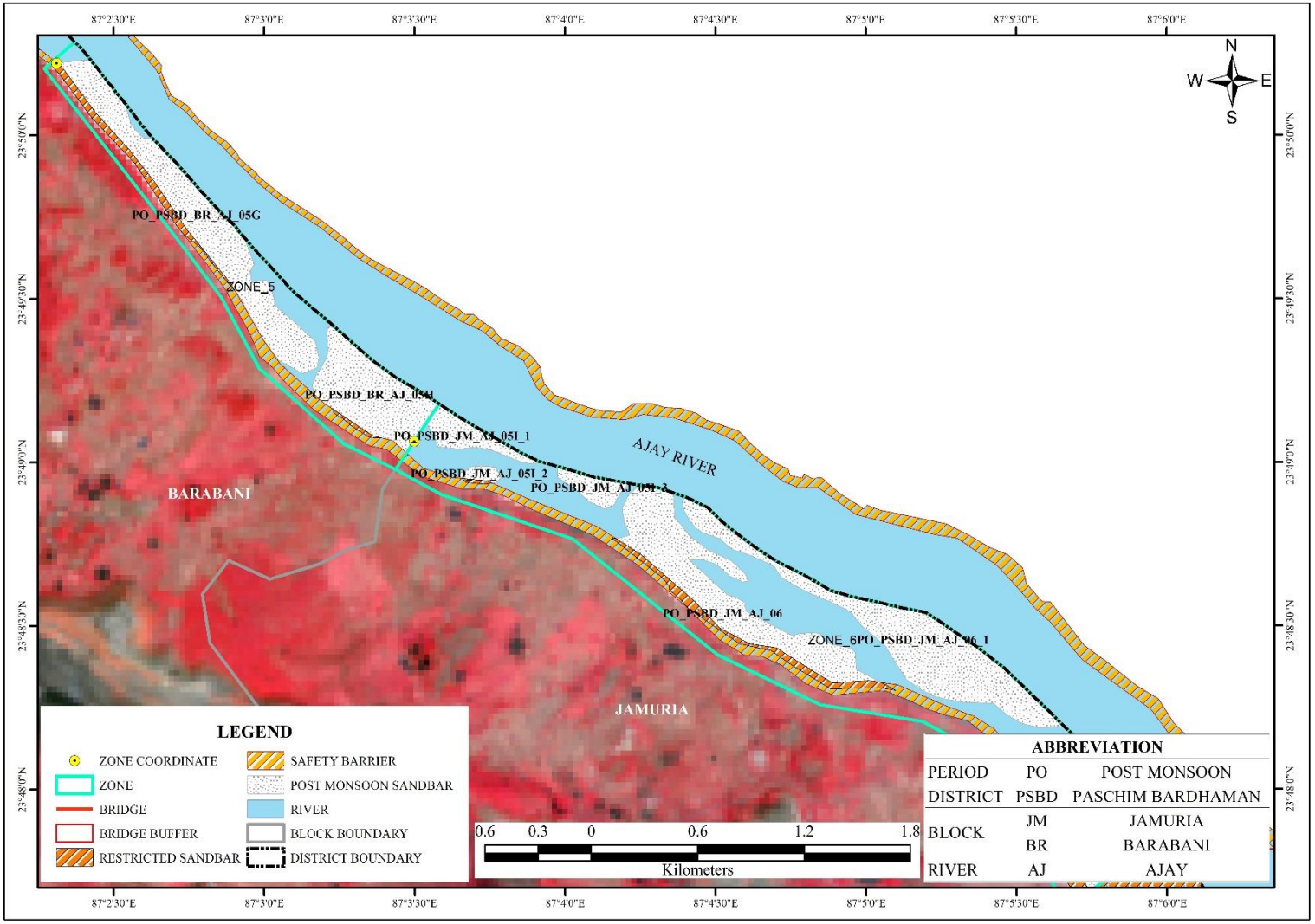


Plate 2B3: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

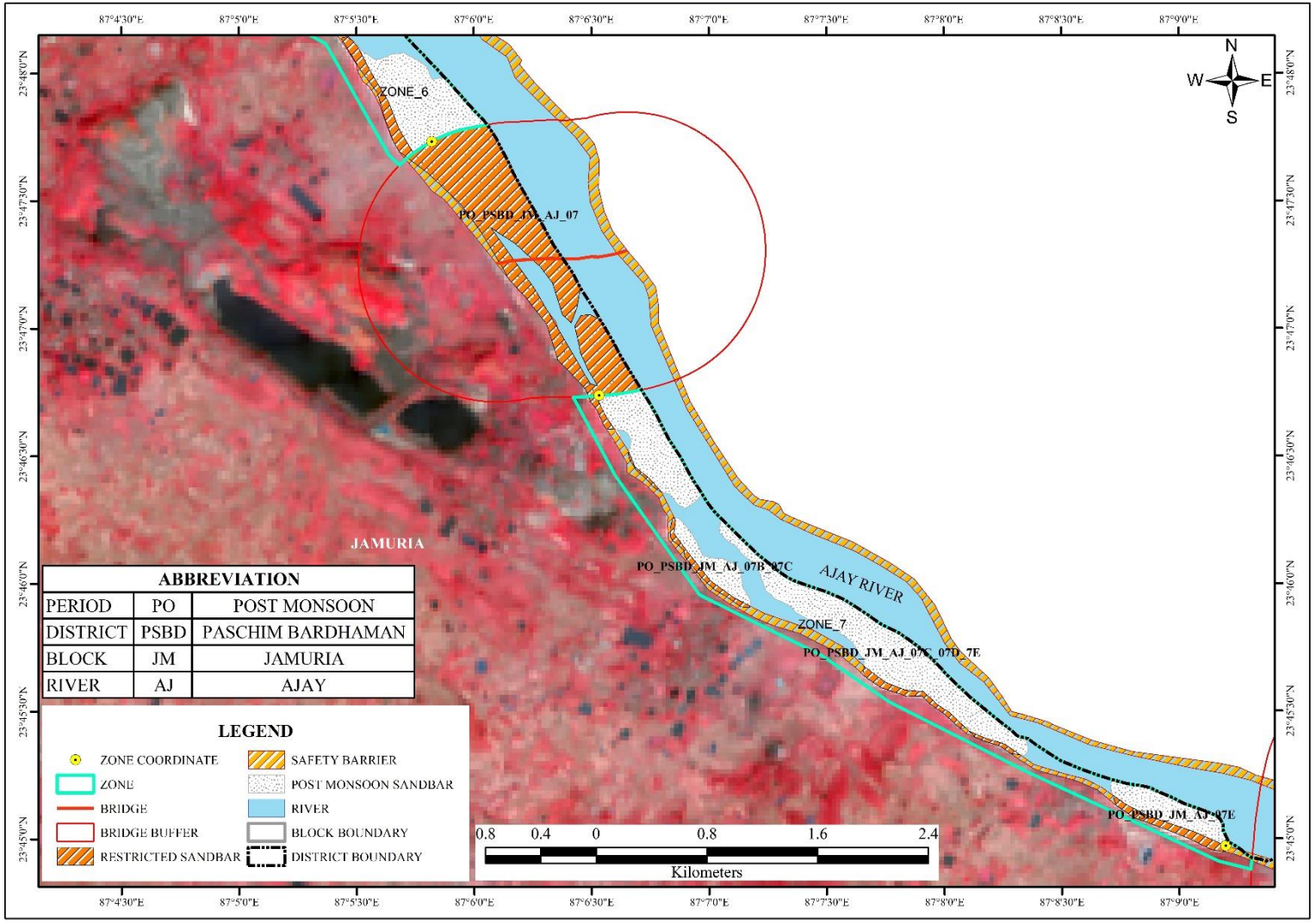


Plate 2B4: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

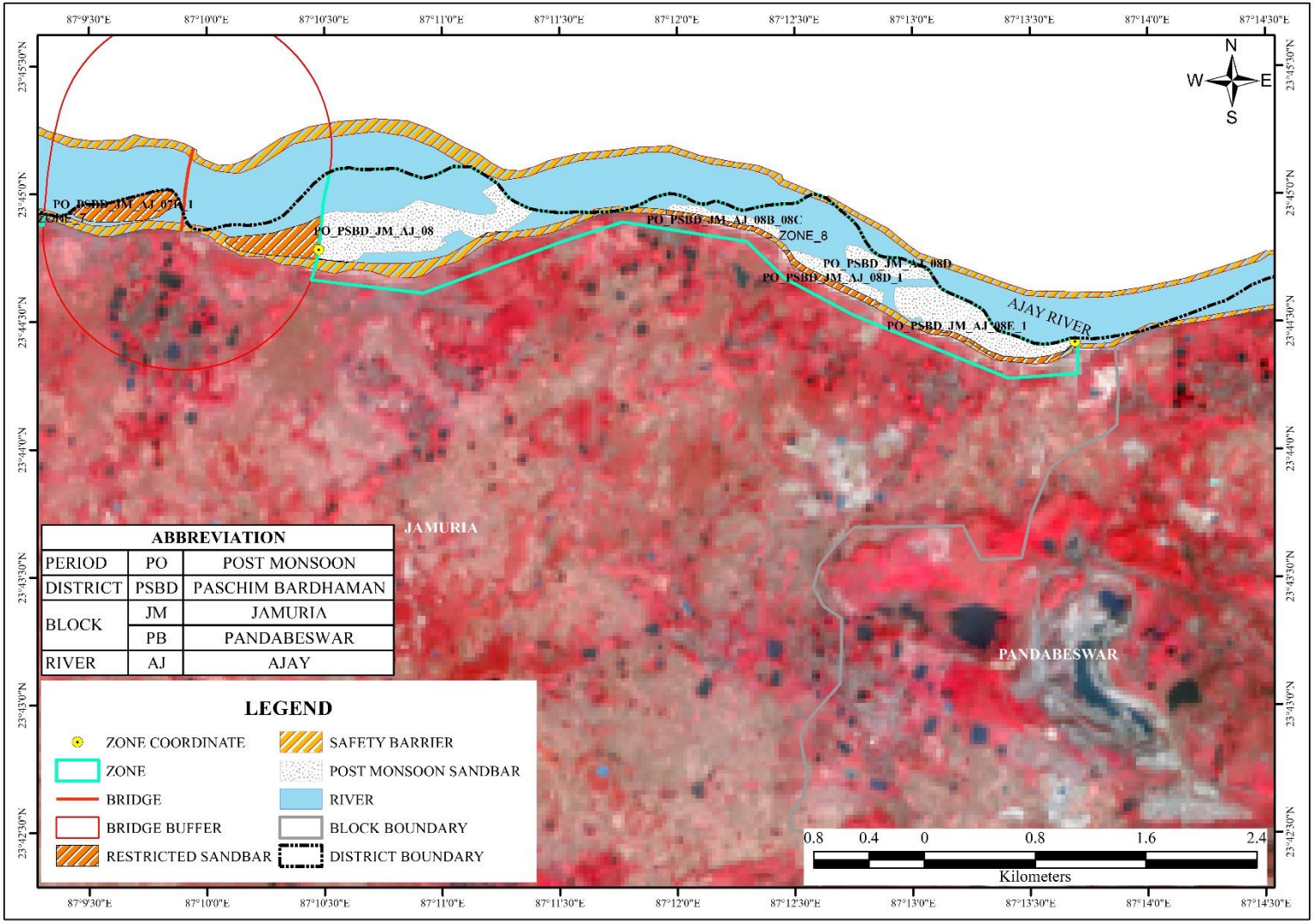


Plate 2B5: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

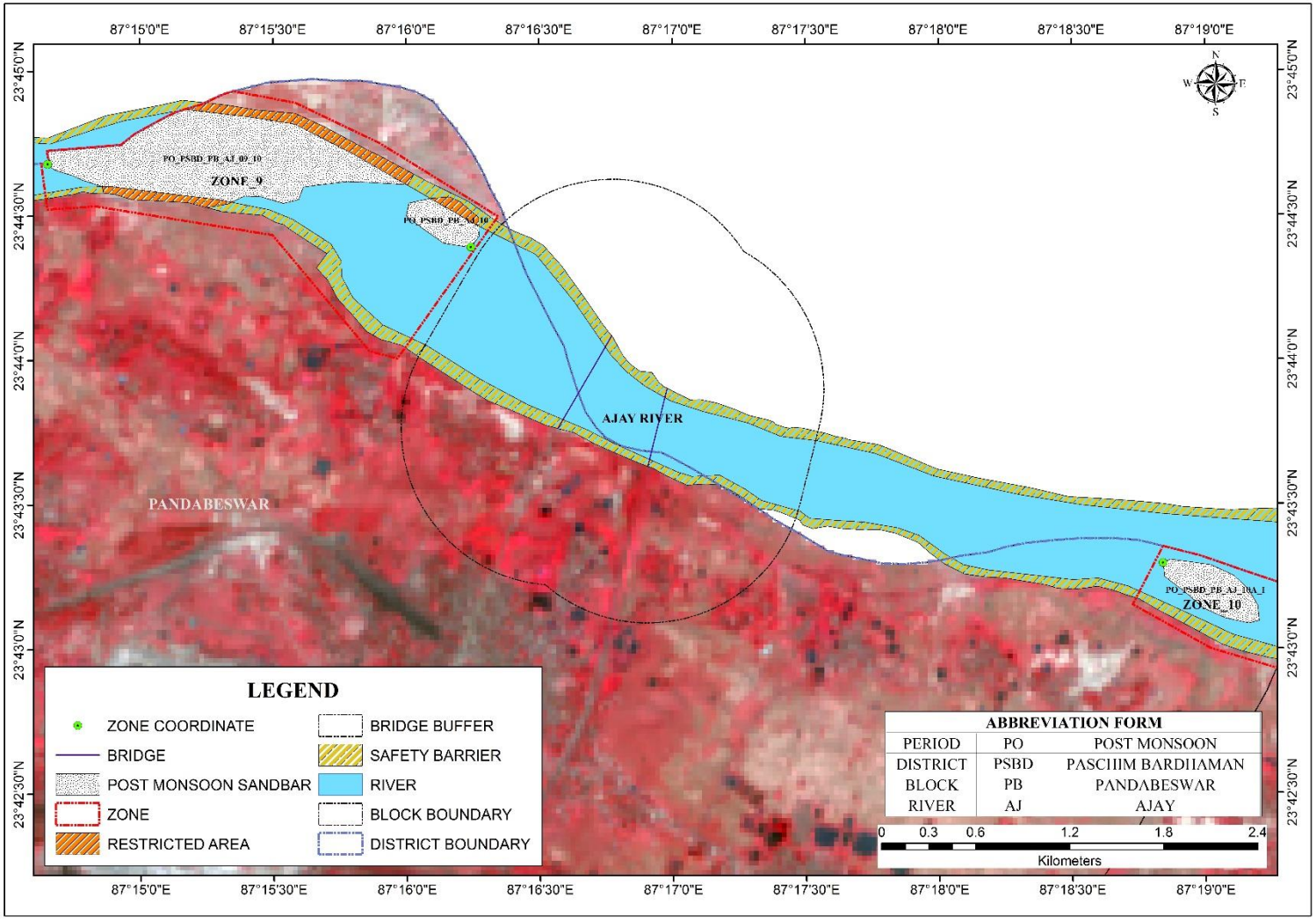


Plate 2B6: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

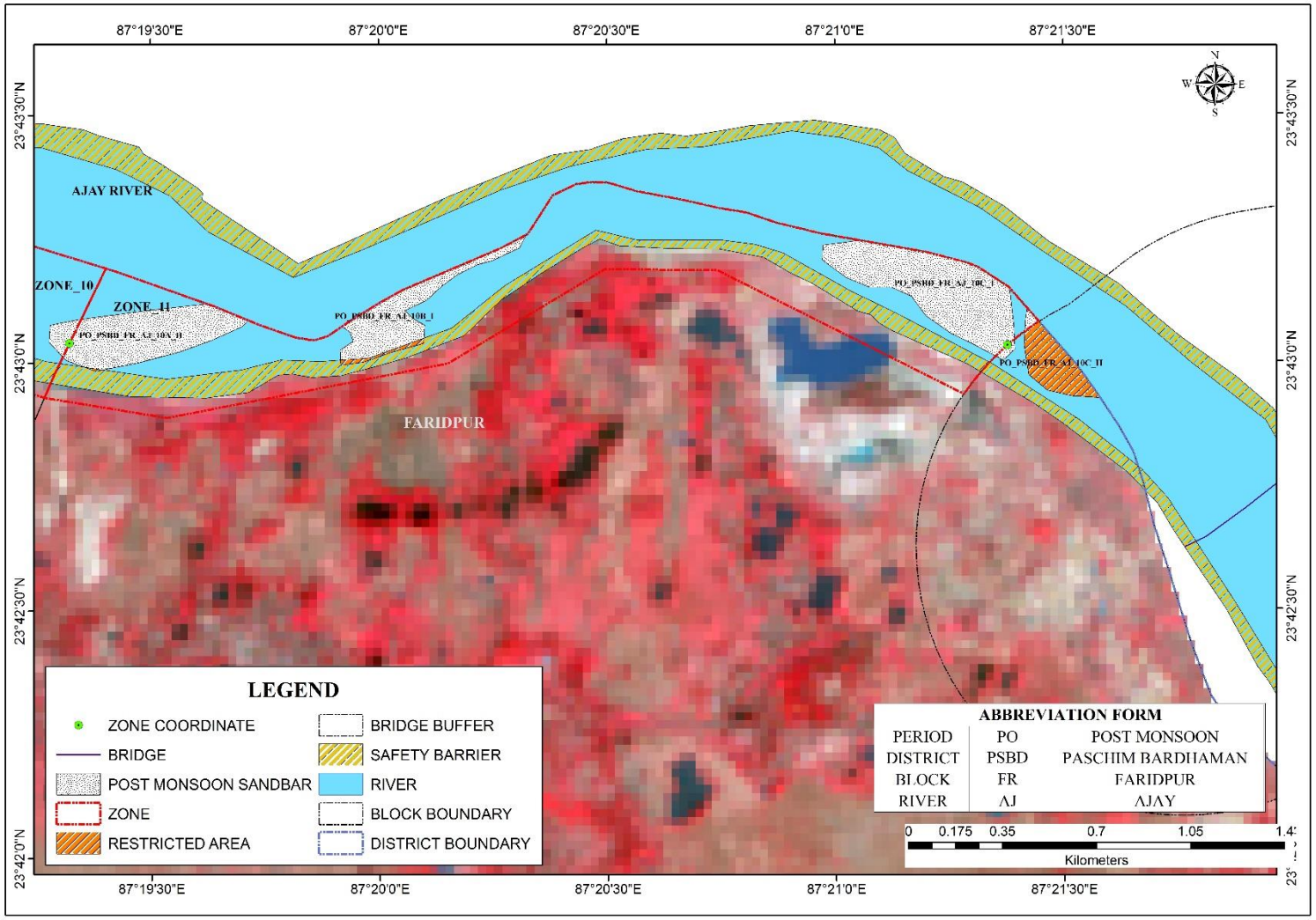


Plate 2B7: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

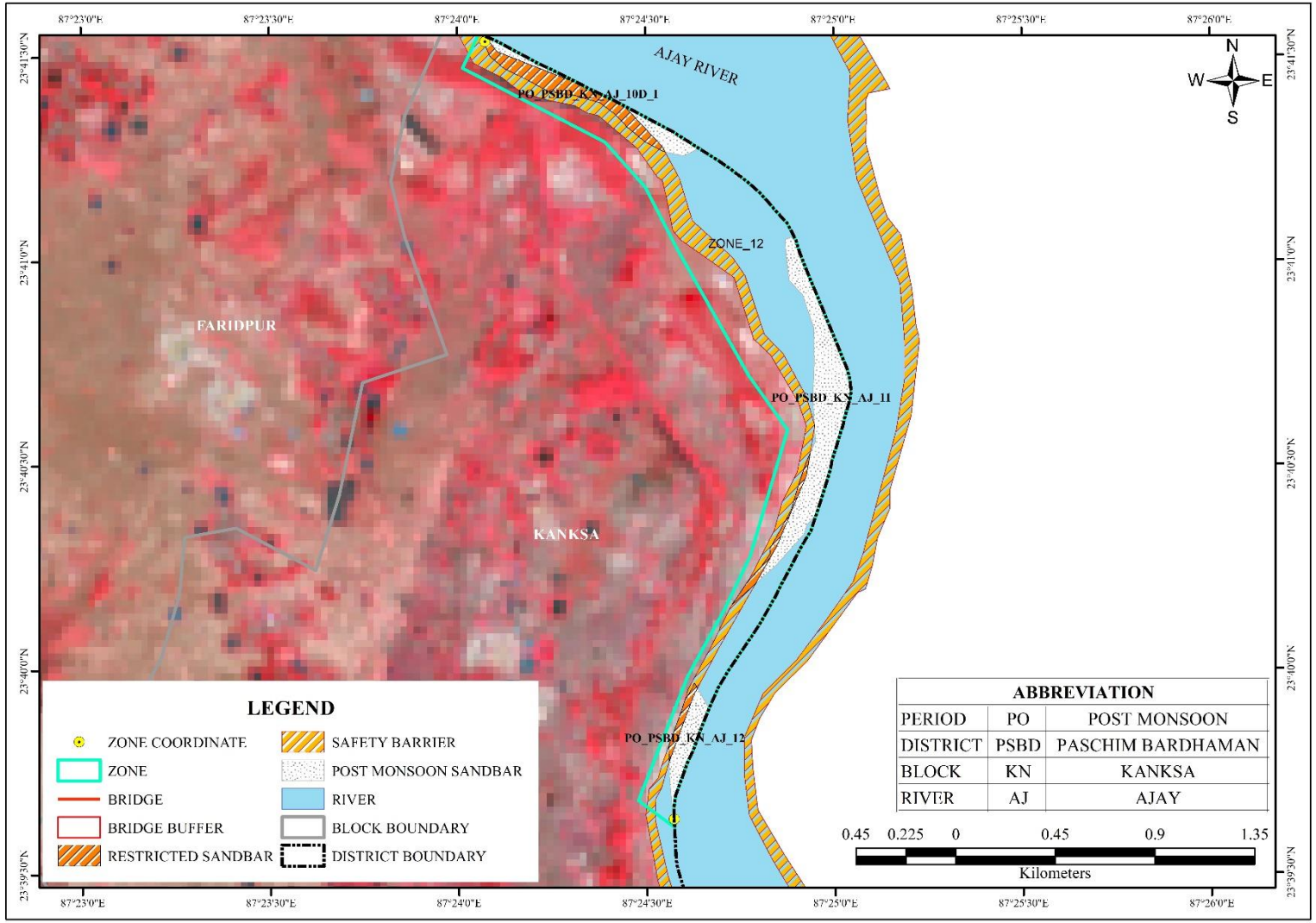


Plate 2B8: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

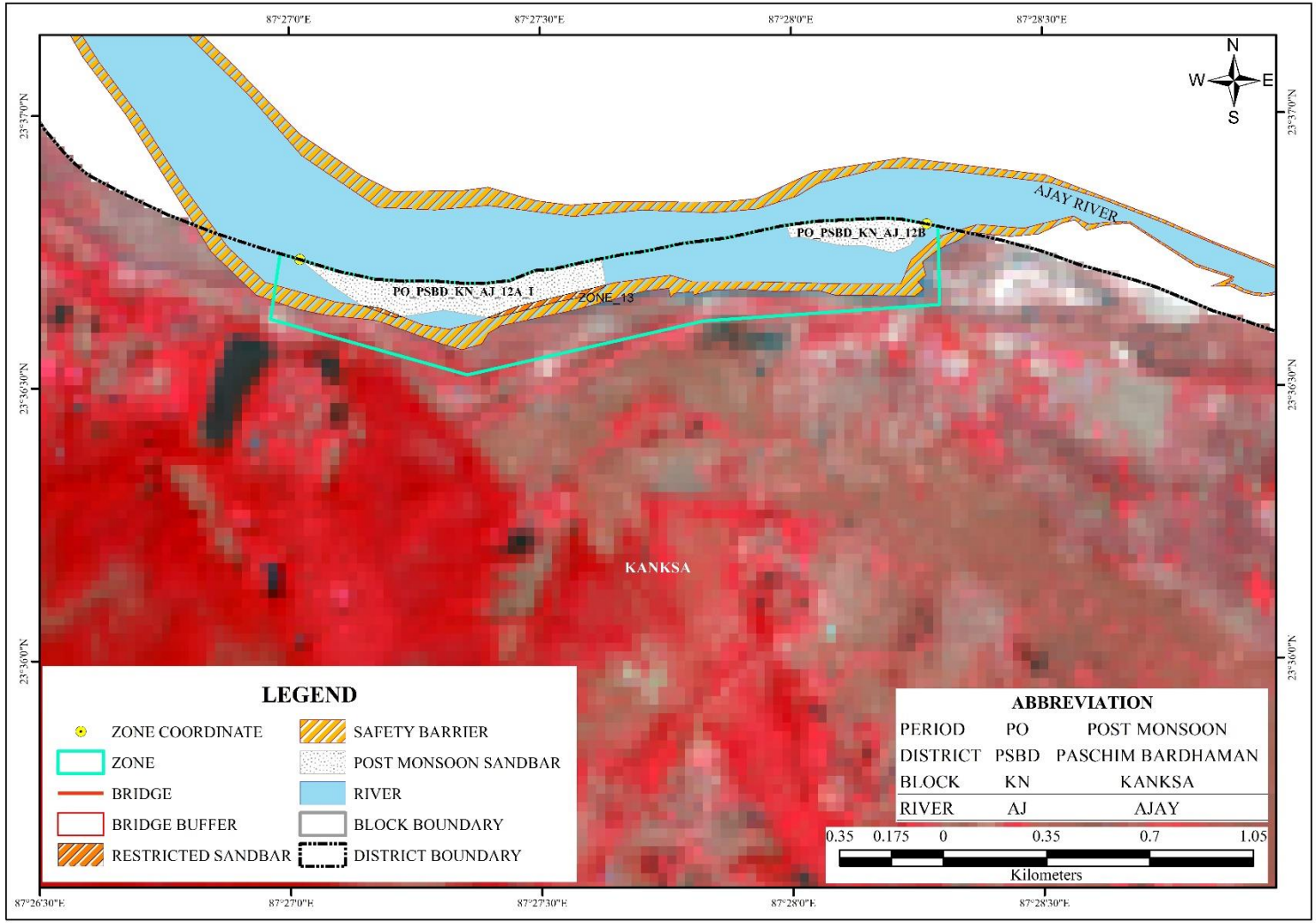


Plate 2B9: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

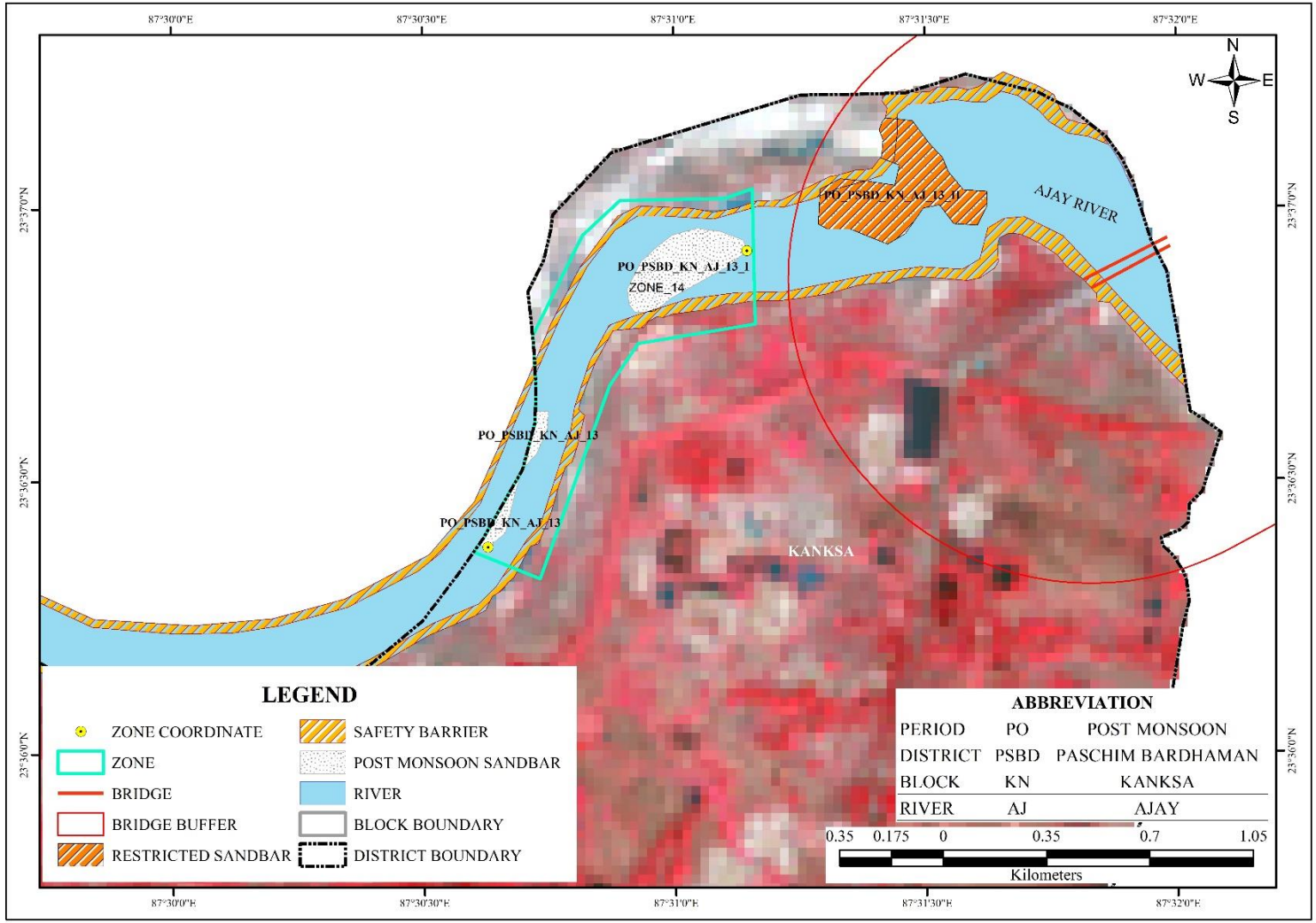
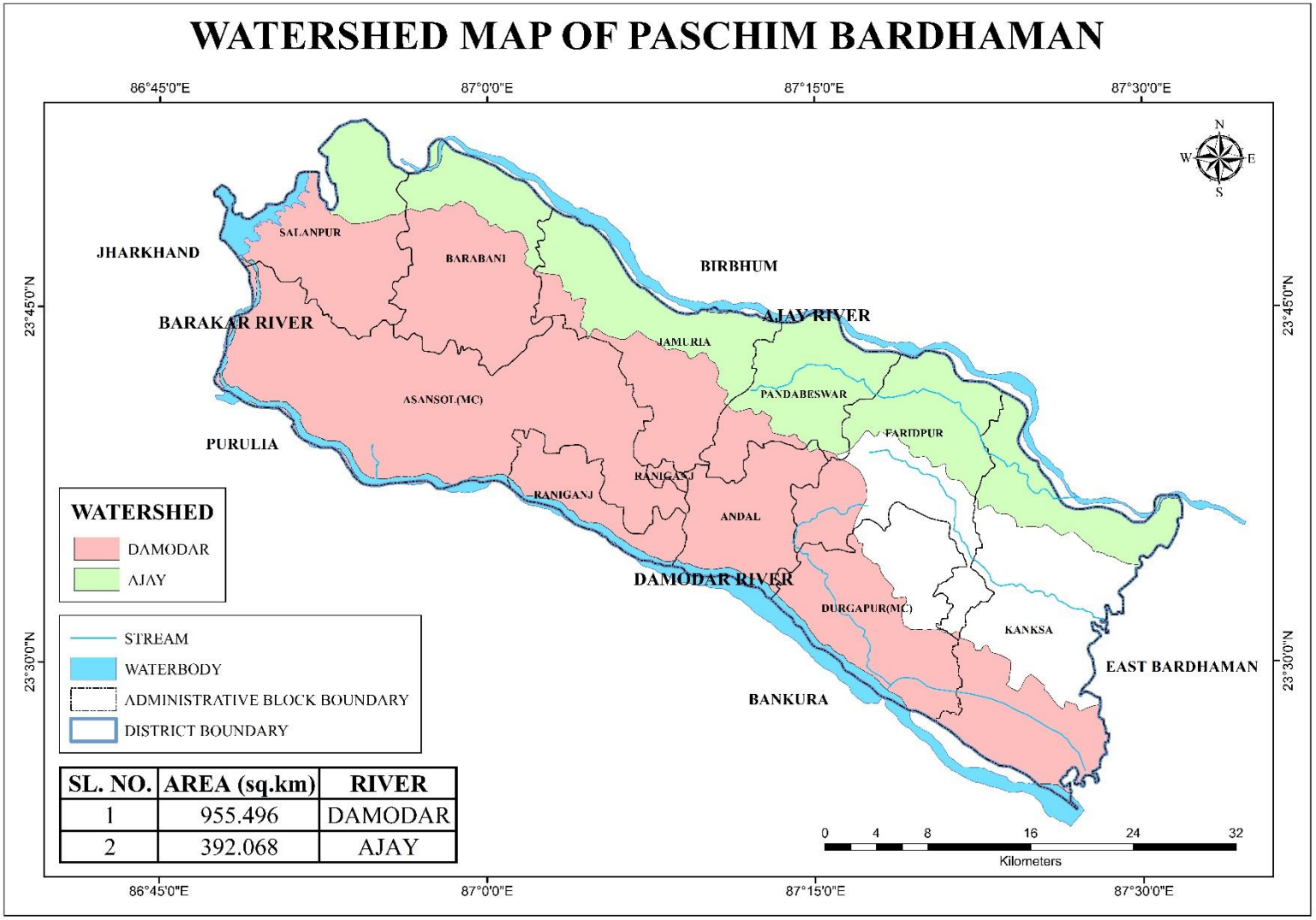


Plate 2B10: Distribution Map of Sand Bars with potential zones on Ajay River During Post-Monsoon Period of Paschim Bardhaman District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November2020)*

PLATE 3

WATERSHED MAP OF THE DISTRICT



SL. NO.	AREA (sq.km)	RIVER
1	955.496	DAMODAR
2	392.068	AJAY

Plate 3A: Watershed Map of Paschim Bardhaman District *(Source: World Wild Fund for Nature, September 2020)*

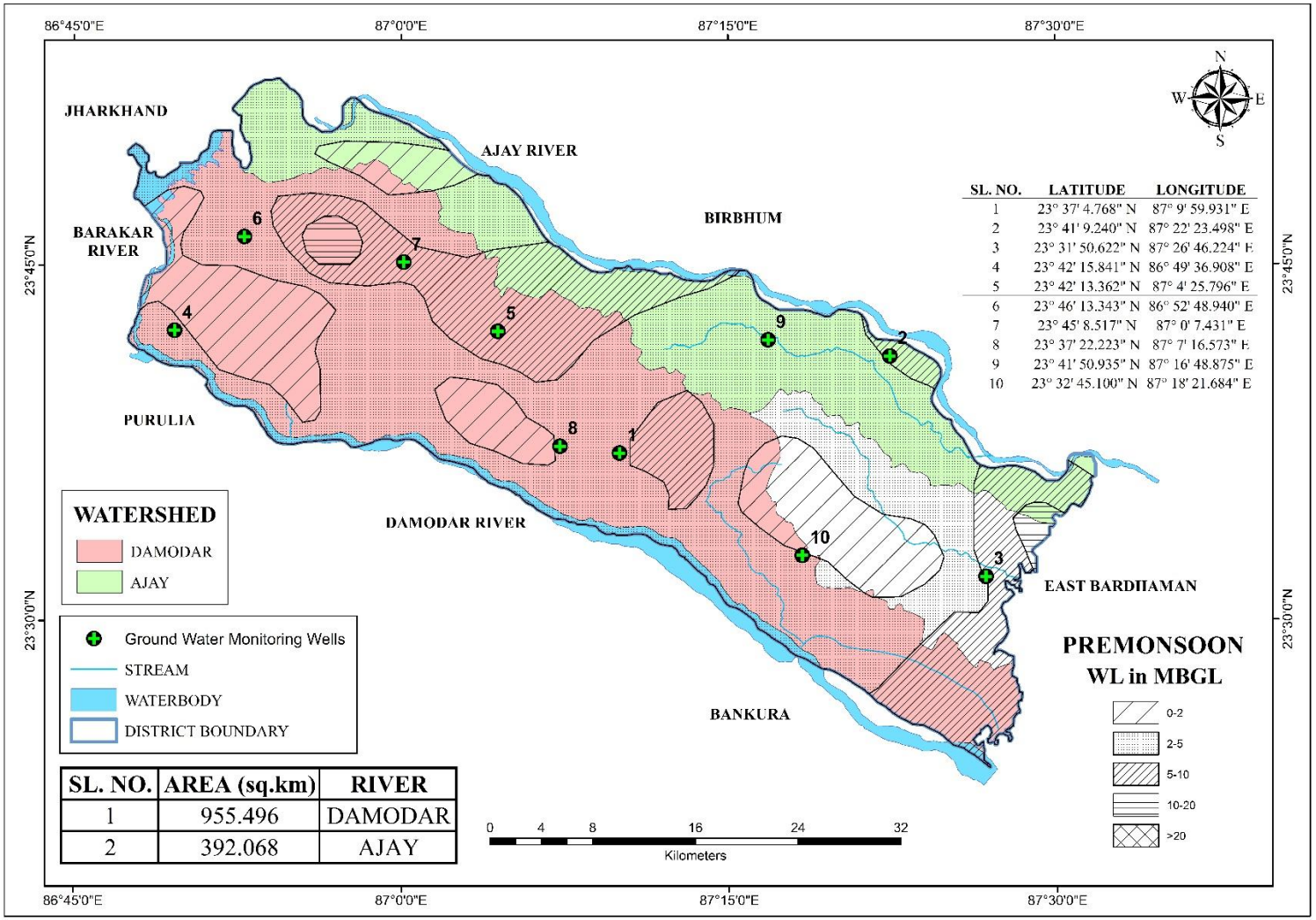


Plate 3B: District Watershed map showing Ground Water level during Pre monsoon period*(Source: World Wild Fund for Nature, September 2020)*

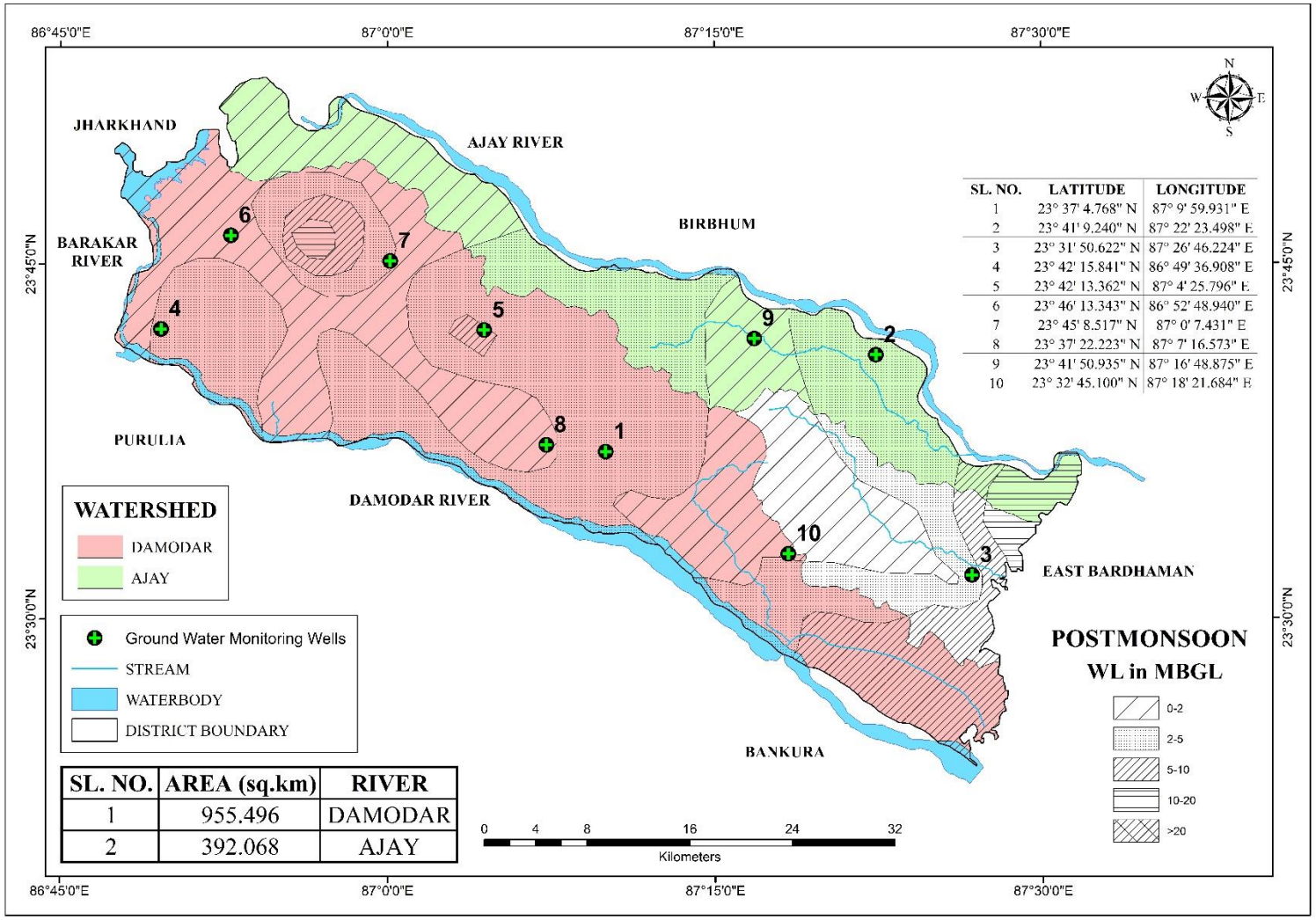


Plate 3C: District Watershed map showing Ground Water level during Post monsoon period *(Source: World Wild Fund for Nature, September 2020)*

PLATE 4

FIELD SURVEY PHOTOGRAPHS

	
4A: Picture of Ajay Riverbed deposit(Date: 15-05-22, Lat: 23° 50' 47.688" Nand Long: 86° 57' 27.476" E)	**4B:Picture of Ajay Riverbed deposit(Date: 15-05-22, Lat: 23° 51' 16.003" Nand Long: 86° 57' 52.345" E)**

PLATE 5

LONG TERM EROSION-ACCRETION MAP OF RIVER BANK

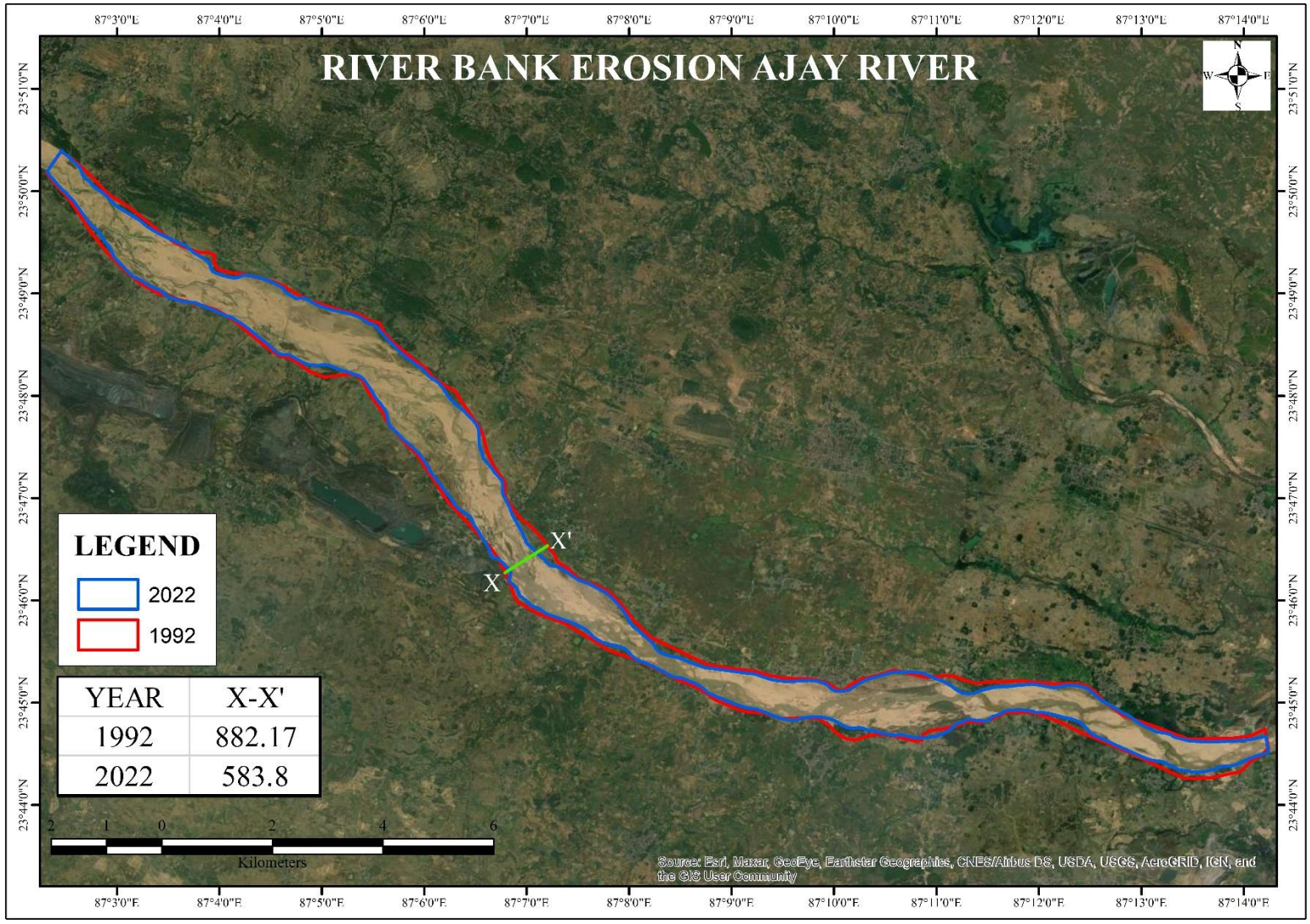


Plate 5: Map showing long-term (10-year or more) erosion-accretion areas on both the banks of Ajay River, Paschim Bardhaman *(Source: ISRO RESOURCE Sat 2 LISS III Sensor)*

Annexure 1
Compliance as per Enforcement & Monitoring Guidelines for sand Mining, 2020 (MoEF& CC) for preparation of District Survey Report

Sl. No.	Particulars	Status
1	District Survey Report for sand mining shall be prepared before the auction/e-auction/grant of the mining lease/Letter of Intent (LoI) by Mining department or department dealing the mining activity in respective states.	Noted.
2	In order to make the inventory of River Bed Material, a detailed survey of the district needs to be carried out, to identify the source of River Bed Material and alternative source of sand (M-Sand). The source will include rivers, de-siltation of reservoir/dams, Patta lands/Khatedari Land, M-sand etc.	Complied with and explained in Chapter 7.
3	District Survey Report is to be prepared in such a way that it not only identifies the mineral-bearing area but also define the mining and no mining zones considering various environmental and social factors.	Complied with and furnished in pg no 74-76.
4	Identification of the source of Sand & M-Sand. The sources may be from Rivers, Lakes, Ponds, Dams, De-silting locations, Patta land/Khtedari lands. The details in case of Rivers such as [name, length of river, type (Perennial or Non-Perennial), Villages, Tehsil, District], in case of Lakes, Ponds, Dams, De-silting locations [Name, owned/maintained by (State Govt./PSU), area, Villages, Tehsil, District] in case of Patta land/Khtedari lands [Owner Name, Sy No, Area, Agricultural/Non-Agricultural, Villages, Tehsil, District], in case of M-Sand Plant [Owner Name, Sy No, Area, Quantity/Annum, Villages, Tehsil, District], needs to be recorded.	Complied with and given in table 7.3.
5	Defining the sources of Sand/M-Sand in the district is the next step for identification of the potential area of deposition/aggradation wherein mining lease could be granted. Detailed survey needs to be carried out for quantification of minerals. The purpose of mining in the river bed is for channelization of rivers so as to avoid the possibility of flooding and to maintain the flow of the rivers. For this, the entire river stretch needs to be surveyed and original ground level (OGL) to be recorded and area of aggradation/deposition needs to be ascertained by comparing the level difference between the outside riverbed OGL and water level. Once the area of aggradation/deposition is identified, then the quantity of River Bed Material available needs to be calculated. The next step is channelization of the river bed and for this central ¾th part of the river, width needs to be identified on a map. Out of the ¾th part area, where there is a deposition/aggradation of the material needs to be identified. The remaining ¼th area needs to be kept as no mining zone for the protection of banks. The specific gravity of the material also needs to be ascertained by analyzing the sample from a NABL accredited lab. Thus, the quantity of material available in metric ton needs to be calculated for mining and no mining zone.	Complied with and given in table 7.11.

Sl. No.	Particulars	Status
6	The permanent boundary pillars need to be erected after identification of an area of aggradation and deposition outside the bank of the river at a safe location for future surveying. The distance between boundary pillars on each side of the bank shall not be more than 100 meters.	Benchmark Pillars are established in strategic locations while boundary pillars will be fixed while fixation of the mining lease boundary subsequent to district level verification.
7	Identifying the mining and no mining zone shall follow with defining the area of sensitivity by ascertaining the distance of the mining area from the protected area, forest, bridges, important structures, habitation etc. and based on the sensitivity the area needs to be defined in sensitive and non-sensitive area.	Complied with and furnished in pg no 93 to 96.
8	Demand and supply of the Riverbed Material through market survey needs to be carried out. In addition to this future demand for the next 5 years also needs to be considered.	Complied with and given in pg no 8.
9	It is suggested that as far as possible the sensitive areas should be avoided for mining, unless local safety condition arises. Such deviation shall be temporary & shall not be a permanent feature.	Complied with and furnished in pg no 93 to 96.
10	Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two-thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.	Noted. The DSR is compose of all the potential sand zones for defining the resources. In a subsequent phase blocking of potential zones shall be done in due consultation with the district level committee. The areas mentioned in the observation points shall be excluded while blocking of sand mining leases which are part of these potential zones marked in this DSR.
11	The final area selected for the mining should be then divided into mining lease as per the requirement of State Government. It is suggested the mining lease area should be so selected as to cover the entire deposition area. Dividing a large area of deposition/aggradation into smaller mining leases should be avoided as it leads to loss of mineral and indirectly promote illegal mining.	Shall be Complied with.
12	Cluster situation shall be examined. A cluster is formed when one mining lease of homogenous mineral is within 500 meters of the other mining lease. In order to reduce the cluster formation mining lease size should be defined in such a way that distance between any two clusters preferably should not be less than 2.5 Km. Mining lease should be defined in such a way that the total area of the mining leases in a cluster should not be more than 10 Ha.	Noted. Due care will be taken while distribution of mining leases either to prevent cluster situation or keeping the prescribed distance in between two mining clusters.
13	The number of a contiguous cluster needs to be ascertained. Contiguous cluster is formed when one cluster is at a distance of 2.5 Km from the other cluster.	Noted and shall be complied with.

Sl. No.	Particulars	Status
14	The mining outside the riverbed on Patta land/Khatedari land be granted when there is possibility of replenishment of material. In case, there is no replenishment then mining lease shall only be granted when there is no riverbed mining possibility within 5 KM of the Patta land/Khatedari land. For government projects, mining could be allowed on Patta land/Khatedari land but the mining should only be done by the Government agency and material should not be used for sale in the open market. Cluster situation as mentioned in para k above is also applicable for the mining in Patta land/Khatedari land.	Noted.
15	The State Government should define the transportation route from the mining lease considering the maximum production from the mines as at this stage the size of mining leases, their location, the quantity of mineral that can be mined safely etc. is available with the State Government. It is suggested that the transportation route should be selected in such a way that the movement of trucks/tippers/tractors from the villages having habitation should be avoided. The transportation route so selected should be verified by the State Government for its carrying capacity.	Noted and final transport route will be submitted during preparation of mine plan.
16	Potential site for mining having its impact on the forest, protected area, habitation, bridges etc, shall be avoided. For this, a sub-divisional committee may be formed which after the site visit shall decide its suitability for mining.	Shall be Complied with.
17	Public consultation-The Comments of the various stakeholders may be sought on the list of mining lease to be auctioned. The State Government shall give an advertisement in the local and national newspaper for seeking comments of the general public on the list of mining lease included in the DSR. The DSR should be placed in the public domain for at least one month from the date of publication of the advertisement for obtaining comments of the general public. The comments so received shall be placed before the sub-divisional committee for active consideration. The final list of sand mining areas [leases to be granted on riverbed &Patta land/Khatedari land, de-siltation location (ponds/lakes/dams), M-Sand Plants (alternate source of sand)] after the public hearing needs to be defined in the final DSR.	After publication of the West Bengal Sand Mining Policy, 2021, it is now eminent that State owned The West Bengal Mineral Development and Trading Corporation Limited (WBMDTCL) shall be responsible for mining of sand/ gravel/ river bed materials in whole state of West Bengal. However, the existing mining leases which were in effect before hand of this Gazzate notification July 2021 will be in operation till the year 2027-28. In order to have the rational distribution of mining leases as per the prevailing norms and guidelines grant of mining leases in the state of West Bengal shall be carried out in phases till all the blocks are under the ambit of WBMDTCL. This DSR thus consist of the identified potential sand deposite areas within which the existing and future mining leases shall occur. The details of the mining leases as and when granted shall follow the procedure described in EMGSM 2020 and prevailing norms.
18	The LOI should not be granted for mining area falling on both riverbed and outside riverbed. Therefore, in the same lease, both types of area should not be included.	Shall be Complied with.

Annexure 2

Estimation of Sand Resources based on sediment load comparison between pre- and post-monsoon period of Paschim Bardhaman district

Abbreviation used in the table as below

ABBREVIATION FORM		
PERIOD	PRE	PRE MONSOON
	PO	POST MONSOON
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	AS	ASANSOL (MC)
	SL	SALANPUR
	BR	BARABANI
	JM	JAMURIA
	RG	RANIGANJ
	PB	PANDABESWAR
	KN	KANSA
	FP	FARIDPUR
	AN	ANDAL
	DG	DURGAPUR (MC)
RIVER	AJ	AJAY
	DA	DAMODAR

Pre monsoon						Post monsoon						Difference in Mcum
SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thickness in m.	Sand Volume in M. Cum	SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thickness in m.	Sand Volume in M. Cum	
1	PR_PSBD_SL_AJ_01A	147.00	29533.07342	2.70	0.08	1	PO_PSBD_SL_AJ_01B_01C	144.00	159183.3257	3.00	0.48	0.25
2	PR_PSBD_SL_AJ_01B	147.00	51303.27792	2.80	0.14							
3	PR_PSBD_SL_AJ_01C	146.00	67322.42419	2.60	0.18							-0.18
4	PR_PSBD_SL_AJ_01D	145.00	38277.08174	2.70	0.10	2	PO_PSBD_BR_AJ_01_02	140.00	98055.11871	3.00	0.29	0.01
5	PR_PSBD_BR_AJ_01	142.00	70697.13213	2.60	0.18							
6	PR_PSBD_BR_AJ_02	140.00	10157.3753	2.70	0.03	3	PO_PSBD_BR_AJ_03	142.00	47832.26365	3.00	0.14	0.12
7	PR_PSBD_BR_AJ_03	133.60	90127.95139	2.60	0.23	4	PO_PSBD_BR_AJ_03_04	134.00	27154.61629	3.00	0.08	-0.15
8	PR_PSBD_BR_AJ_04	132.00	26074.79133	2.60	0.07	5	PO_PSBD_BR_AJ_05	134.00	157654.6785	2.80	0.44	0.37
9	PR_PSBD_BR_AJ_05	131.00	118132.9753	2.60	0.31	6	PO_PSBD_BR_AJ_05A	132.00	219554.935	2.80	0.61	0.31
10	PR_PSBD_BR_AJ_05A	130.00	230154.6069	2.60	0.60	7	PO_PSBD_BR_AJ_05_I	131.00	19667.27673	3.80	0.07	-0.52
11	PR_PSBD_BR_AJ_05B	129.00	224077.2623	2.70	0.61	8	PO_PSBD_BR_AJ_05B_05C_05D_05E	129.00	1080435.081	3.00	3.24	0.88
12	PR_PSBD_BR_AJ_05C	128.00	247708.2476	2.70	0.67							
13	PR_PSBD_BR_AJ_05D	128.00	388594.7402	2.80	1.09							
14	PR_PSBD_BR_AJ_05E	129.00	170206.2519	2.80	0.48							-0.48
15	PR_PSBD_BR_AJ_05F	127.00	78695.02992	2.80	0.22	9	PO_PSBD_BR_AJ_05G	125.00	417435.1421	2.00	0.83	0.61
16	PR_PSBD_BR_AJ_05G	126.00	262187.2771	2.70	0.71	10	PO_PSBD_BR_AJ_05H	125.00	244065.9	3.00	0.73	0.02
17	PR_PSBD_BR_AJ_05H	126.00	180111.9754	2.70	0.49	11	PO_PSBD_JM_AJ_05I_1	125.00	69646.24992	3.00	0.21	-0.28
18	PR_PSBD_JM_AJ_05I	126.00	1190604.356	2.70	3.21	12	PO_PSBD_JM_AJ_05I_2	125.00	18448.78242	3.00	0.06	-1.81
						13	PO_PSBD_JM_AJ_05I_3	120.00	44477.56444	3.00	0.13	
						14	PO_PSBD_JM_AJ_06	120.00	404717.7792	3.00	1.21	
19	PR_PSBD_JM_AJ_06	126.00	89315.00378	2.60	0.23	15	PO_PSBD_JM_AJ_06_1	124.00	407420.5379	3.00	1.22	3.31
						16	PO_PSBD_JM_AJ_07	124.00	772621.9106	3.00	2.32	
20	PR_PSBD_JM_AJ_07	125.00	1108905.055	1.60	1.77		PO_PSBD_JM_AJ_07_I	124.00	567607.1174	3.00	1.70	-0.07
21	PR_PSBD_JM_AJ_07A	125.00	335092.325	2.60	0.87	17	PO_PSBD_JM_AJ_07B_07C	124.00	120338.5667	3.00	0.36	-1.61
22	PR_PSBD_JM_AJ_07B	124.00	423779.3668	2.60	1.10							
23	PR_PSBD_JM_AJ_07C	116.00	64670.92309	2.60	0.17	18	PO_PSBD_JM_AJ_07C_07D_7E	115.00	575242.2354	3.00	1.73	1.31
24	PR_PSBD_JM_AJ_07D	115.00	90049.38724	2.70	0.24							
25	PR_PSBD_JM_AJ_07E	114.00	417792.4088	2.70	1.13	19	PO_PSBD_JM_AJ_07E	115.00	193233.6345	3.00	0.58	2.88
						20	PO_PSBD_JM_AJ_07E_1	113.00	110694.5069	3.00	0.33	
						21	PO_PSBD_JM_AJ_08	112.00	1031403.715	3.00	3.09	
26	PR_PSBD_JM_AJ_08	113.00	577113.9835	2.70	1.56							-1.56
27	PR_PSBD_JM_AJ_08A	111.00	120143.2548	2.70	0.32	22	PO_PSBD_JM_AJ_08B_08C	107.00	72941.10362	3.00	0.22	-0.19

Pre monsoon						Post monsoon						Difference in Mcum
SL No	Sand Bar_Code	RL (m)	Area in sq.m	Sand Thickne	Sand Volume	SL No	Sand Bar_Code	RL (m)	Area in sq.m	Sand Thickne	Sand Volume	
28	PR_PSBD_JM_AJ_08B	110.00	30361.17311	2.70	0.08							
29	PR_PSBD_JM_AJ_08C	109.00	114204.9816	2.70	0.31	23	PO_PSBD_JM_AJ_08D	105.00	60979.89924	3.00	0.18	-0.13
30	PR_PSBD_JM_AJ_08D	106.00	69279.26902	2.70	0.19	24	PO_PSBD_JM_AJ_08D_I	102.00	96975.73657	3.00	0.29	0.97
						25	PO_PSBD_JM_AJ_08E_1	102.00	289455.6637	3.00	0.87	
31	PR_PSBD_JM_AJ_08E	103.00	223224.0828	2.70	0.60	26	PO_PSBD_PB_AJ_09_10	102.00	917070.7714	3.00	2.75	1.19
32	PR_PSBD_PB_AJ_09	103.00	354722.6405	2.70	0.96							
33	PR_PSBD_PB_AJ_10	103.00	360827.4037	2.70	0.97	27	PO_PSBD_PB_AJ_10	102.00	102472.9874	3.00	0.31	-0.25
						28	PO_PSBD_PB_AJ_10A_I	102.00	138485.9401	3.00	0.42	
34	PR_PSBD_PB_AJ_10A	101.00	154081.2662	2.70	0.42	29	PO_PSBD_FR_AJ_10A_II	102.00	111935.8863	3.00	0.34	0.13
						30	PO_PSBD_FR_AJ_10B_I	100.00	69549.08698	3.00	0.21	
35	PR_PSBD_FR_AJ_10B	101.00	46547.1336	2.70	0.13	31	PO_PSBD_FR_AJ_10C_I	99.00	148028.2735	4.00	0.59	0.47
36	PR_PSBD_FR_AJ_10C	98.00	33258.66067	2.70	0.09	32	PO_PSBD_FR_AJ_10C_II	98.00	42642.63403	3.00	0.13	0.70
						33	PO_PSBD_KN_AJ_10D_I	95.00	219461.1074	3.00	0.66	
37	PR_PSBD_FR_AJ_10D	97.00	114600.5052	2.70	0.31							-0.31
38	PR_PSBD_KN_AJ_10E	96.00	187933.19	2.70	0.51	34	PO_PSBD_KN_AJ_11	95.00	219302.2656	3.00	0.66	0.15
39	PR_PSBD_KN_AJ_11	92.00	36377.29832	2.70	0.10	35	PO_PSBD_KN_AJ_12	90.00	43612.519	3.00	0.13	0.03
40	PR_PSBD_KN_AJ_12	90.00	13268.78528	2.70	0.04	36	PO_PSBD_KN_AJ_12A_I	90.00	102832.1432	3.00	0.31	0.27
41	PR_PSBD_KN_AJ_12A	87.00	37347.55787	2.70	0.10	37	PO_PSBD_KN_AJ_12B	85.00	36312.28849	3.00	0.11	0.01
42	PR_PSBD_KN_AJ_12B	80.00	65708.37878	2.70	0.18	38	PO_PSBD_KN_AJ_13	82.00	52869.21068	3.00	0.16	-0.02
						39	PO_PSBD_KN_AJ_13_I	82.00	117216.2851	3.00	0.35	0.35
						40	PO_PSBD_KN_AJ_13_II	82.00	116113.0468	3.00	0.35	0.35
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Damodar River												
1	PR_PSBD_AN_DA_01	81.00	1901776.086	2.70	5.13	1	PO_PSBD_AN_DA_01	82.00	1901776.086	3.00	5.71	0.57

Annexure 3
Boundary Coordinates of Potential Blocks of Paschim Bardhaman District

Abbreviation used in the table as below

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	AS	ASANSOL (MC)
	SL	SALANPUR
	BR	BARABANI
	JM	JAMURIA
	RG	RANIGANJ
	PB	PANDABESWAR
	KN	KANSA
	FP	FARIDPUR
	AN	ANDAL
	DG	DURGAPUR (MC)
RIVER	AJ	AJAY
	DA	DAMODAR

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
PSBD_SL_AJ_01B_01C	1	23° 51' 26.415" N	86° 55' 56.876" E
	2	23° 51' 25.726" N	86° 55' 55.605" E
	3	23° 51' 26.407" N	86° 55' 54.897" E
	4	23° 51' 30.238" N	86° 55' 54.062" E
	5	23° 51' 33.046" N	86° 55' 53.926" E
	6	23° 51' 38.126" N	86° 55' 54.058" E
	7	23° 51' 43.319" N	86° 55' 55.171" E
	8	23° 51' 43.479" N	86° 55' 55.919" E
	9	23° 51' 44.098" N	86° 55' 58.133" E
	10	23° 51' 44.720" N	86° 55' 59.926" E
	11	23° 51' 43.942" N	86° 55' 59.762" E
	12	23° 51' 42.964" N	86° 55' 59.511" E
	13	23° 51' 42.463" N	86° 55' 59.382" E
	14	23° 51' 40.984" N	86° 55' 59.001" E
	15	23° 51' 38.617" N	86° 55' 58.951" E
	16	23° 51' 37.628" N	86° 55' 58.930" E
	17	23° 51' 37.039" N	86° 55' 58.917" E
	18	23° 51' 35.657" N	86° 55' 58.888" E
	19	23° 51' 34.654" N	86° 55' 58.866" E
	20	23° 51' 34.572" N	86° 55' 58.864" E
	21	23° 51' 33.002" N	86° 55' 57.693" E
	22	23° 51' 32.199" N	86° 55' 56.176" E
	23	23° 51' 31.439" N	86° 55' 55.602" E
	24	23° 51' 30.406" N	86° 55' 55.452" E
	25	23° 51' 28.548" N	86° 55' 55.828" E
PSBD_BR_AJ_01_02	1	23° 50' 47.384" N	86° 57' 12.972" E
	2	23° 50' 47.693" N	86° 57' 14.786" E
	3	23° 50' 47.807" N	86° 57' 15.451" E
	4	23° 50' 48.253" N	86° 57' 19.113" E
	5	23° 50' 48.452" N	86° 57' 20.749" E
	6	23° 50' 48.681" N	86° 57' 22.625" E
	7	23° 50' 49.896" N	86° 57' 28.563" E
	8	23° 50' 51.898" N	86° 57' 34.190" E
	9	23° 50' 51.990" N	86° 57' 34.449" E
	10	23° 50' 52.585" N	86° 57' 35.447" E
	11	23° 50' 53.792" N	86° 57' 37.471" E
	12	23° 50' 55.893" N	86° 57' 40.053" E
	13	23° 50' 56.943" N	86° 57' 41.343" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	14	23° 50' 59.348" N	86° 57' 43.537" E
	15	23° 50' 58.703" N	86° 57' 43.489" E
	16	23° 50' 55.537" N	86° 57' 43.190" E
	17	23° 50' 55.489" N	86° 57' 43.155" E
	18	23° 50' 54.117" N	86° 57' 40.865" E
	19	23° 50' 53.646" N	86° 57' 39.380" E
	20	23° 50' 53.049" N	86° 57' 37.498" E
	21	23° 50' 51.395" N	86° 57' 33.378" E
	22	23° 50' 50.225" N	86° 57' 30.464" E
	23	23° 50' 49.657" N	86° 57' 29.084" E
	24	23° 50' 49.640" N	86° 57' 29.043" E
	25	23° 50' 45.891" N	86° 57' 26.821" E
	26	23° 50' 45.778" N	86° 57' 26.685" E
	27	23° 50' 44.792" N	86° 57' 25.744" E
	28	23° 50' 44.447" N	86° 57' 19.549" E
	29	23° 50' 44.934" N	86° 57' 19.081" E
	30	23° 50' 45.431" N	86° 57' 18.604" E
	31	23° 50' 45.637" N	86° 57' 16.059" E
	32	23° 50' 45.245" N	86° 57' 15.469" E
	33	23° 50' 44.907" N	86° 57' 13.334" E
	34	23° 50' 44.199" N	86° 57' 8.849" E
	35	23° 50' 44.196" N	86° 57' 8.828" E
	36	23° 50' 43.698" N	86° 57' 5.679" E
	37	23° 50' 43.693" N	86° 57' 5.645" E
	38	23° 50' 43.525" N	86° 57' 4.582" E
	39	23° 50' 42.887" N	86° 57' 0.543" E
	40	23° 50' 42.784" N	86° 56' 59.887" E
	41	23° 50' 42.774" N	86° 56' 59.785" E
	42	23° 50' 42.748" N	86° 56' 59.493" E
	43	23° 50' 42.576" N	86° 56' 57.606" E
	44	23° 50' 43.318" N	86° 56' 59.588" E
	45	23° 50' 43.804" N	86° 57' 0.883" E
	46	23° 50' 43.833" N	86° 57' 0.962" E
	47	23° 50' 45.135" N	86° 57' 4.438" E
	48	23° 50' 46.270" N	86° 57' 5.811" E
	49	23° 50' 46.591" N	86° 57' 8.330" E
	50	23° 50' 47.007" N	86° 57' 10.768" E
PSBD_BR_AJ_03	1	23° 51' 6.895" N	86° 57' 47.402" E
	2	23° 51' 9.729" N	86° 57' 48.508" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	3	23° 51' 10.861" N	86° 57' 48.867" E
	4	23° 51' 12.808" N	86° 57' 49.486" E
	5	23° 51' 12.849" N	86° 57' 49.499" E
	6	23° 51' 15.045" N	86° 57' 49.915" E
	7	23° 51' 16.292" N	86° 57' 53.077" E
	8	23° 51' 8.436" N	86° 57' 51.187" E
	9	23° 51' 8.127" N	86° 57' 51.032" E
	10	23° 51' 8.121" N	86° 57' 51.028" E
	11	23° 51' 8.055" N	86° 57' 50.995" E
	12	23° 51' 6.762" N	86° 57' 50.342" E
	13	23° 51' 6.483" N	86° 57' 50.201" E
	14	23° 51' 3.032" N	86° 57' 48.457" E
	15	23° 51' 0.985" N	86° 57' 47.282" E
	16	23° 51' 0.132" N	86° 57' 46.793" E
	17	23° 50' 59.384" N	86° 57' 46.363" E
	18	23° 50' 58.051" N	86° 57' 45.453" E
	19	23° 51' 0.631" N	86° 57' 44.985" E
	20	23° 51' 1.338" N	86° 57' 44.965" E
	21	23° 51' 3.311" N	86° 57' 45.905" E
	22	23° 51' 3.894" N	86° 57' 46.182" E
	23	23° 51' 4.465" N	86° 57' 46.454" E
	24	23° 51' 6.550" N	86° 57' 47.267" E
PSBD_BR_AJ_03_04	1	23° 51' 37.202" N	86° 57' 50.976" E
	2	23° 51' 36.966" N	86° 57' 50.995" E
	3	23° 51' 34.158" N	86° 57' 51.225" E
	4	23° 51' 31.880" N	86° 57' 51.412" E
	5	23° 51' 28.583" N	86° 57' 52.085" E
	6	23° 51' 27.475" N	86° 57' 52.311" E
	7	23° 51' 27.323" N	86° 57' 52.326" E
	8	23° 51' 27.316" N	86° 57' 52.327" E
	9	23° 51' 21.418" N	86° 57' 52.911" E
	10	23° 51' 16.875" N	86° 57' 50.817" E
	11	23° 51' 16.387" N	86° 57' 50.109" E
	12	23° 51' 21.803" N	86° 57' 50.406" E
	13	23° 51' 22.562" N	86° 57' 50.392" E
	14	23° 51' 25.025" N	86° 57' 50.345" E
	15	23° 51' 28.077" N	86° 57' 50.287" E
	16	23° 51' 33.570" N	86° 57' 50.379" E
	17	23° 51' 34.551" N	86° 57' 50.537" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	18	23° 51' 34.997" N	86° 57' 50.609" E
	19	23° 51' 36.347" N	86° 57' 50.827" E
	20	23° 51' 36.430" N	86° 57' 50.840" E
PSBD_BR_AJ_05	1	23° 52' 2.046" N	86° 58' 4.789" E
	2	23° 52' 2.912" N	86° 58' 5.826" E
	3	23° 52' 2.964" N	86° 58' 5.934" E
	4	23° 52' 0.851" N	86° 58' 8.958" E
	5	23° 51' 59.946" N	86° 58' 8.105" E
	6	23° 51' 59.559" N	86° 58' 7.740" E
	7	23° 51' 59.453" N	86° 58' 7.641" E
	8	23° 51' 58.362" N	86° 58' 6.612" E
	9	23° 51' 56.997" N	86° 58' 5.326" E
	10	23° 51' 56.281" N	86° 58' 4.650" E
	11	23° 51' 55.998" N	86° 58' 4.384" E
	12	23° 51' 52.621" N	86° 58' 0.852" E
	13	23° 51' 50.525" N	86° 57' 58.660" E
	14	23° 51' 48.445" N	86° 57' 57.459" E
	15	23° 51' 47.734" N	86° 57' 57.049" E
	16	23° 51' 47.638" N	86° 57' 56.993" E
	17	23° 51' 46.281" N	86° 57' 56.210" E
	18	23° 51' 45.736" N	86° 57' 55.896" E
	19	23° 51' 45.535" N	86° 57' 55.780" E
	20	23° 51' 44.393" N	86° 57' 55.323" E
	21	23° 51' 45.095" N	86° 57' 53.504" E
	22	23° 51' 45.735" N	86° 57' 53.503" E
	23	23° 51' 47.707" N	86° 57' 53.503" E
	24	23° 51' 47.727" N	86° 57' 53.512" E
	25	23° 51' 48.755" N	86° 57' 54.012" E
	26	23° 51' 49.063" N	86° 57' 54.162" E
	27	23° 51' 49.592" N	86° 57' 54.419" E
	28	23° 51' 50.483" N	86° 57' 54.906" E
	29	23° 51' 51.738" N	86° 57' 55.592" E
	30	23° 51' 53.150" N	86° 57' 56.365" E
	31	23° 51' 53.365" N	86° 57' 56.532" E
	32	23° 51' 54.657" N	86° 57' 57.792" E
	33	23° 51' 54.798" N	86° 57' 58.828" E
	34	23° 51' 55.194" N	86° 57' 59.424" E
	35	23° 51' 56.828" N	86° 58' 0.601" E
	36	23° 51' 57.031" N	86° 58' 0.675" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	37	23° 51' 59.116" N	86° 58' 1.433" E
	38	23° 51' 59.157" N	86° 58' 1.910" E
	39	23° 51' 59.218" N	86° 58' 2.617" E
	40	23° 51' 59.253" N	86° 58' 3.023" E
	41	23° 52' 1.841" N	86° 58' 5.477" E
PSBD_BR_AJ_05_I	1	23° 51' 59.195" N	86° 58' 32.368" E
	2	23° 51' 58.507" N	86° 58' 31.919" E
	3	23° 51' 58.612" N	86° 58' 30.232" E
	4	23° 52' 0.854" N	86° 58' 27.174" E
	5	23° 52' 1.122" N	86° 58' 26.867" E
	6	23° 52' 1.348" N	86° 58' 26.499" E
	7	23° 52' 4.311" N	86° 58' 28.806" E
	8	23° 52' 3.669" N	86° 58' 29.112" E
	9	23° 52' 2.464" N	86° 58' 30.871" E
	10	23° 52' 0.572" N	86° 58' 32.256" E
PSBD_BR_AJ_05A	1	23° 51' 54.038" N	86° 58' 43.740" E
	2	23° 51' 52.192" N	86° 58' 45.576" E
	3	23° 51' 51.664" N	86° 58' 46.349" E
	4	23° 51' 47.685" N	86° 58' 52.177" E
	5	23° 51' 43.672" N	86° 58' 57.269" E
	6	23° 51' 40.579" N	86° 59' 0.678" E
	7	23° 51' 37.049" N	86° 59' 4.812" E
	8	23° 51' 36.900" N	86° 59' 5.090" E
	9	23° 51' 36.201" N	86° 59' 6.388" E
	10	23° 51' 36.128" N	86° 59' 6.525" E
	11	23° 51' 36.043" N	86° 59' 6.683" E
	12	23° 51' 35.804" N	86° 59' 7.126" E
	13	23° 51' 33.699" N	86° 59' 7.958" E
	14	23° 51' 31.463" N	86° 59' 9.230" E
	15	23° 51' 28.675" N	86° 59' 12.411" E
	16	23° 51' 27.987" N	86° 59' 14.956" E
	17	23° 51' 27.609" N	86° 59' 17.538" E
	18	23° 51' 26.697" N	86° 59' 18.758" E
	19	23° 51' 25.784" N	86° 59' 19.184" E
	20	23° 51' 24.963" N	86° 59' 18.621" E
	21	23° 51' 25.952" N	86° 59' 15.933" E
	22	23° 51' 27.775" N	86° 59' 9.347" E
	23	23° 51' 29.805" N	86° 59' 5.305" E
	24	23° 51' 32.076" N	86° 59' 2.274" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	25	23° 51' 36.171" N	86° 58' 57.971" E
	26	23° 51' 42.296" N	86° 58' 51.646" E
	27	23° 51' 45.469" N	86° 58' 47.544" E
	28	23° 51' 47.187" N	86° 58' 45.729" E
	29	23° 51' 50.387" N	86° 58' 42.398" E
	30	23° 51' 52.417" N	86° 58' 40.003" E
	31	23° 51' 53.965" N	86° 58' 38.020" E
	32	23° 51' 55.342" N	86° 58' 35.774" E
	33	23° 51' 56.856" N	86° 58' 35.175" E
	34	23° 51' 58.129" N	86° 58' 35.661" E
	35	23° 51' 58.370" N	86° 58' 36.896" E
	36	23° 51' 58.393" N	86° 58' 38.902" E
	37	23° 51' 58.155" N	86° 58' 39.170" E
	38	23° 51' 54.869" N	86° 58' 42.874" E
	39	23° 51' 54.567" N	86° 58' 43.214" E
	40	23° 51' 54.398" N	86° 58' 43.382" E
PSBD_BR_AJ_05B_05C_05D_05E	1	23° 50' 57.423" N	87° 0' 42.957" E
	2	23° 50' 58.516" N	87° 0' 42.646" E
	3	23° 50' 58.537" N	87° 0' 42.568" E
	4	23° 50' 58.638" N	87° 0' 42.610" E
	5	23° 51' 6.717" N	87° 0' 45.317" E
	6	23° 51' 6.655" N	87° 0' 45.424" E
	7	23° 50' 56.878" N	87° 1' 2.394" E
	8	23° 50' 50.706" N	87° 1' 10.911" E
	9	23° 50' 48.555" N	87° 1' 13.831" E
	10	23° 50' 46.103" N	87° 1' 19.835" E
	11	23° 50' 40.081" N	87° 1' 28.702" E
	12	23° 50' 38.757" N	87° 1' 29.959" E
	13	23° 50' 29.934" N	87° 1' 54.239" E
	14	23° 50' 26.738" N	87° 1' 56.402" E
	15	23° 50' 22.253" N	87° 2' 1.772" E
	16	23° 50' 20.309" N	87° 2' 1.006" E
	17	23° 50' 20.077" N	87° 2' 0.460" E
	18	23° 50' 28.035" N	87° 1' 30.473" E
	19	23° 50' 32.338" N	87° 1' 22.523" E
	20	23° 50' 37.157" N	87° 1' 10.645" E
	21	23° 50' 40.857" N	87° 1' 7.652" E
	22	23° 50' 45.503" N	87° 1' 2.321" E
PSBD_BR_AJ_05G	1	23° 49' 35.173" N	87° 2' 57.214" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	2	23° 49' 32.860" N	87° 2' 57.572" E
	3	23° 49' 33.410" N	87° 2' 59.547" E
	4	23° 49' 33.299" N	87° 3' 0.565" E
	5	23° 49' 30.601" N	87° 3' 1.881" E
	6	23° 49' 28.894" N	87° 3' 2.060" E
	7	23° 49' 25.534" N	87° 3' 6.308" E
	8	23° 49' 22.229" N	87° 3' 10.197" E
	9	23° 49' 19.255" N	87° 3' 10.914" E
	10	23° 49' 17.383" N	87° 3' 10.554" E
	11	23° 49' 16.283" N	87° 3' 7.681" E
	12	23° 49' 18.707" N	87° 3' 3.013" E
	13	23° 49' 22.507" N	87° 2' 59.902" E
	14	23° 49' 27.354" N	87° 2' 56.912" E
	15	23° 49' 30.768" N	87° 2' 54.878" E
	16	23° 49' 31.432" N	87° 2' 54.259" E
	17	23° 49' 32.781" N	87° 2' 53.416" E
	18	23° 49' 42.677" N	87° 2' 44.629" E
	19	23° 49' 51.455" N	87° 2' 38.178" E
	20	23° 49' 57.393" N	87° 2' 33.130" E
	21	23° 50' 4.191" N	87° 2' 26.398" E
	22	23° 50' 12.624" N	87° 2' 19.667" E
	23	23° 50' 13.269" N	87° 2' 18.780" E
	24	23° 50' 13.313" N	87° 2' 19.273" E
	25	23° 50' 13.793" N	87° 2' 24.122" E
	26	23° 50' 13.497" N	87° 2' 25.741" E
	27	23° 50' 13.258" N	87° 2' 25.951" E
	28	23° 50' 12.596" N	87° 2' 26.531" E
	29	23° 50' 10.289" N	87° 2' 28.458" E
	30	23° 50' 9.711" N	87° 2' 28.941" E
	31	23° 50' 9.405" N	87° 2' 29.197" E
	32	23° 50' 9.141" N	87° 2' 29.480" E
	33	23° 50' 8.959" N	87° 2' 29.757" E
	34	23° 50' 8.633" N	87° 2' 29.937" E
	35	23° 50' 8.285" N	87° 2' 30.133" E
	36	23° 50' 8.172" N	87° 2' 30.227" E
	37	23° 50' 7.983" N	87° 2' 30.386" E
	38	23° 50' 7.856" N	87° 2' 30.501" E
	39	23° 50' 5.991" N	87° 2' 32.208" E
	40	23° 50' 1.967" N	87° 2' 33.503" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	41	23° 50' 0.067" N	87° 2' 35.195" E
	42	23° 49' 59.448" N	87° 2' 36.205" E
	43	23° 49' 59.335" N	87° 2' 37.908" E
	44	23° 49' 59.045" N	87° 2' 38.208" E
	45	23° 49' 58.513" N	87° 2' 38.760" E
	46	23° 49' 58.377" N	87° 2' 38.902" E
	47	23° 49' 54.957" N	87° 2' 42.452" E
	48	23° 49' 54.029" N	87° 2' 43.416" E
	49	23° 49' 50.033" N	87° 2' 47.199" E
	50	23° 49' 46.167" N	87° 2' 51.053" E
	51	23° 49' 43.519" N	87° 2' 54.022" E
	52	23° 49' 42.345" N	87° 2' 55.088" E
	53	23° 49' 41.376" N	87° 2' 55.968" E
	54	23° 49' 38.146" N	87° 2' 57.335" E
	55	23° 49' 36.384" N	87° 2' 58.052" E
PSBD_BR_AJ_05H	1	23° 49' 6.123" N	87° 3' 31.563" E
	2	23° 49' 3.875" N	87° 3' 29.943" E
	3	23° 49' 3.859" N	87° 3' 29.931" E
	4	23° 49' 1.719" N	87° 3' 28.389" E
	5	23° 49' 4.017" N	87° 3' 25.624" E
	6	23° 49' 4.470" N	87° 3' 23.493" E
	7	23° 49' 4.844" N	87° 3' 21.734" E
	8	23° 49' 9.690" N	87° 3' 13.840" E
	9	23° 49' 10.905" N	87° 3' 11.861" E
	10	23° 49' 12.498" N	87° 3' 9.941" E
	11	23° 49' 14.188" N	87° 3' 9.590" E
	12	23° 49' 14.879" N	87° 3' 9.865" E
	13	23° 49' 16.476" N	87° 3' 10.584" E
	14	23° 49' 16.880" N	87° 3' 11.045" E
	15	23° 49' 19.173" N	87° 3' 12.470" E
	16	23° 49' 20.522" N	87° 3' 12.770" E
	17	23° 49' 21.734" N	87° 3' 12.681" E
	18	23° 49' 23.276" N	87° 3' 12.532" E
	19	23° 49' 24.157" N	87° 3' 12.562" E
	20	23° 49' 24.707" N	87° 3' 12.652" E
	21	23° 49' 24.872" N	87° 3' 13.311" E
	22	23° 49' 24.680" N	87° 3' 14.299" E
	23	23° 49' 23.696" N	87° 3' 15.502" E
	24	23° 49' 21.255" N	87° 3' 18.485" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	25	23° 49' 18.781" N	87° 3' 21.508" E
	26	23° 49' 17.662" N	87° 3' 23.179" E
	27	23° 49' 15.516" N	87° 3' 26.385" E
	28	23° 49' 13.208" N	87° 3' 30.683" E
	29	23° 49' 13.165" N	87° 3' 30.764" E
	30	23° 49' 12.707" N	87° 3' 31.617" E
	31	23° 49' 12.593" N	87° 3' 31.828" E
	33	23° 49' 7.250" N	87° 3' 32.375" E
	32	23° 49' 10.738" N	87° 3' 34.889" E
PSBD_JM_AJ_05I_1	1	23° 49' 7.250" N	87° 3' 32.375" E
	2	23° 49' 10.738" N	87° 3' 34.889" E
	3	23° 49' 10.105" N	87° 3' 35.933" E
	4	23° 49' 10.000" N	87° 3' 36.106" E
	5	23° 49' 8.030" N	87° 3' 39.356" E
	6	23° 49' 1.859" N	87° 3' 50.965" E
	7	23° 49' 0.228" N	87° 3' 54.706" E
	8	23° 49' 0.098" N	87° 3' 55.175" E
	9	23° 48' 59.747" N	87° 3' 53.459" E
	10	23° 49' 0.078" N	87° 3' 51.305" E
	11	23° 49' 1.015" N	87° 3' 48.612" E
	12	23° 49' 2.173" N	87° 3' 45.501" E
	13	23° 49' 2.780" N	87° 3' 42.030" E
	14	23° 49' 2.396" N	87° 3' 39.097" E
	15	23° 49' 2.893" N	87° 3' 34.668" E
	16	23° 49' 5.702" N	87° 3' 33.293" E
PSBD_JM_AJ_05I_2	1	23° 48' 56.226" N	87° 3' 46.276" E
	2	23° 48' 56.160" N	87° 3' 45.536" E
	3	23° 48' 56.600" N	87° 3' 44.439" E
	4	23° 48' 57.043" N	87° 3' 39.434" E
	5	23° 48' 57.716" N	87° 3' 38.616" E
	6	23° 48' 59.146" N	87° 3' 41.250" E
	7	23° 48' 59.311" N	87° 3' 43.225" E
	8	23° 48' 59.089" N	87° 3' 46.098" E
	9	23° 48' 57.272" N	87° 3' 47.294" E
PSBD_JM_AJ_05I_3	1	23° 48' 51.976" N	87° 4' 9.615" E
	2	23° 48' 51.481" N	87° 4' 7.819" E
	3	23° 48' 52.914" N	87° 4' 4.528" E
	4	23° 48' 54.567" N	87° 4' 2.913" E
	5	23° 48' 55.724" N	87° 4' 0.998" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	6	23° 48' 57.212" N	87° 3' 58.545" E
	7	23° 48' 59.262" N	87° 3' 58.447" E
	8	23° 48' 59.043" N	87° 3' 59.302" E
	9	23° 48' 59.002" N	87° 3' 59.463" E
	10	23° 48' 57.860" N	87° 4' 3.664" E
	11	23° 48' 57.298" N	87° 4' 5.735" E
	12	23° 48' 56.174" N	87° 4' 12.451" E
	13	23° 48' 56.145" N	87° 4' 12.623" E
	14	23° 48' 56.128" N	87° 4' 12.723" E
	15	23° 48' 54.178" N	87° 4' 10.933" E
PSBD_JM_AJ_06	1	23° 48' 46.463" N	87° 4' 24.873" E
	2	23° 48' 43.873" N	87° 4' 28.582" E
	3	23° 48' 41.944" N	87° 4' 33.130" E
	4	23° 48' 39.520" N	87° 4' 35.881" E
	5	23° 48' 38.308" N	87° 4' 36.599" E
	6	23° 48' 38.033" N	87° 4' 35.521" E
	7	23° 48' 39.002" N	87° 4' 33.052" E
	8	23° 48' 41.395" N	87° 4' 29.957" E
	9	23° 48' 42.167" N	87° 4' 27.325" E
	10	23° 48' 42.134" N	87° 4' 24.690" E
	11	23° 48' 35.562" N	87° 4' 32.500" E
	12	23° 48' 35.370" N	87° 4' 33.635" E
	13	23° 48' 34.302" N	87° 4' 35.803" E
	14	23° 48' 32.711" N	87° 4' 35.965" E
	15	23° 48' 27.961" N	87° 4' 45.737" E
	16	23° 48' 27.962" N	87° 4' 45.737" E
	17	23° 48' 28.275" N	87° 4' 45.899" E
	18	23° 48' 28.536" N	87° 4' 46.752" E
	19	23° 48' 28.686" N	87° 4' 49.303" E
	20	23° 48' 28.479" N	87° 4' 50.949" E
	21	23° 48' 27.136" N	87° 4' 51.771" E
	22	23° 48' 26.481" N	87° 4' 53.416" E
	23	23° 48' 26.240" N	87° 4' 54.725" E
	24	23° 48' 25.826" N	87° 4' 56.969" E
	25	23° 48' 25.034" N	87° 4' 57.866" E
	26	23° 48' 23.416" N	87° 4' 57.977" E
	27	23° 48' 22.004" N	87° 4' 57.995" E
	28	23° 48' 21.254" N	87° 4' 59.538" E
	29	23° 48' 19.602" N	87° 5' 2.937" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	30	23° 48' 19.930" N	87° 5' 0.489" E
	31	23° 48' 19.504" N	87° 4' 53.288" E
	32	23° 48' 23.293" N	87° 4' 46.652" E
	33	23° 48' 25.963" N	87° 4' 42.165" E
	34	23° 48' 26.653" N	87° 4' 36.929" E
	35	23° 48' 29.582" N	87° 4' 30.852" E
	36	23° 48' 34.746" N	87° 4' 25.525" E
	37	23° 48' 43.041" N	87° 4' 15.195" E
	38	23° 48' 46.031" N	87° 4' 10.134" E
	39	23° 48' 45.994" N	87° 4' 10.403" E
	40	23° 48' 46.634" N	87° 4' 12.904" E
	41	23° 48' 49.002" N	87° 4' 11.768" E
	42	23° 48' 51.590" N	87° 4' 11.410" E
	43	23° 48' 53.902" N	87° 4' 12.608" E
	44	23° 48' 55.785" N	87° 4' 14.772" E
	45	23° 48' 55.609" N	87° 4' 16.243" E
	46	23° 48' 55.417" N	87° 4' 18.349" E
	47	23° 48' 54.521" N	87° 4' 21.177" E
	48	23° 48' 54.397" N	87° 4' 21.569" E
	49	23° 48' 52.907" N	87° 4' 21.645" E
	50	23° 48' 49.713" N	87° 4' 21.883" E
	51	23° 48' 48.721" N	87° 4' 22.959" E
PSBD_JM_AJ_06_1	1	23° 48' 11.567" N	87° 5' 39.478" E
	2	23° 48' 11.295" N	87° 5' 34.572" E
	3	23° 48' 12.068" N	87° 5' 31.221" E
	4	23° 48' 13.612" N	87° 5' 28.110" E
	5	23° 48' 15.761" N	87° 5' 25.419" E
	6	23° 48' 15.929" N	87° 5' 19.973" E
	7	23° 48' 16.427" N	87° 5' 16.203" E
	8	23° 48' 17.144" N	87° 5' 13.331" E
	9	23° 48' 18.137" N	87° 5' 11.177" E
	10	23° 48' 20.121" N	87° 5' 8.066" E
	11	23° 48' 23.591" N	87° 5' 5.615" E
	12	23° 48' 26.345" N	87° 5' 3.822" E
	13	23° 48' 29.816" N	87° 4' 59.335" E
	14	23° 48' 32.626" N	87° 4' 56.764" E
	15	23° 48' 34.390" N	87° 4' 52.935" E
	16	23° 48' 35.879" N	87° 4' 48.986" E
	17	23° 48' 37.698" N	87° 4' 45.336" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	18	23° 48' 38.855" N	87° 4' 43.182" E
	19	23° 48' 41.003" N	87° 4' 41.628" E
	20	23° 48' 43.043" N	87° 4' 36.661" E
	21	23° 48' 44.036" N	87° 4' 33.251" E
	22	23° 48' 45.909" N	87° 4' 30.977" E
	23	23° 48' 47.177" N	87° 4' 27.327" E
	24	23° 48' 47.839" N	87° 4' 26.131" E
	25	23° 48' 49.436" N	87° 4' 24.755" E
	26	23° 48' 51.254" N	87° 4' 23.679" E
	27	23° 48' 52.741" N	87° 4' 23.381" E
	28	23° 48' 53.665" N	87° 4' 23.876" E
	29	23° 48' 53.502" N	87° 4' 24.391" E
	30	23° 48' 52.576" N	87° 4' 26.460" E
	31	23° 48' 51.666" N	87° 4' 28.490" E
	32	23° 48' 50.162" N	87° 4' 30.156" E
	33	23° 48' 48.970" N	87° 4' 31.477" E
	34	23° 48' 47.183" N	87° 4' 33.880" E
	35	23° 48' 45.025" N	87° 4' 37.003" E
	36	23° 48' 44.730" N	87° 4' 37.431" E
	37	23° 48' 43.252" N	87° 4' 39.729" E
	38	23° 48' 41.790" N	87° 4' 42.255" E
	39	23° 48' 40.297" N	87° 4' 45.481" E
	40	23° 48' 39.305" N	87° 4' 47.626" E
	41	23° 48' 37.713" N	87° 4' 50.700" E
	42	23° 48' 36.430" N	87° 4' 52.962" E
	43	23° 48' 35.391" N	87° 4' 56.972" E
	44	23° 48' 34.303" N	87° 5' 2.413" E
	45	23° 48' 33.264" N	87° 5' 7.183" E
	46	23° 48' 33.191" N	87° 5' 7.622" E
	47	23° 48' 32.680" N	87° 5' 10.662" E
	48	23° 48' 32.291" N	87° 5' 12.146" E
	49	23° 48' 31.267" N	87° 5' 13.883" E
	50	23° 48' 30.812" N	87° 5' 14.655" E
	51	23° 48' 30.214" N	87° 5' 15.580" E
	52	23° 48' 28.905" N	87° 5' 17.600" E
	53	23° 48' 28.684" N	87° 5' 17.941" E
	54	23° 48' 28.250" N	87° 5' 18.644" E
	55	23° 48' 26.146" N	87° 5' 22.048" E
	56	23° 48' 25.987" N	87° 5' 22.305" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	57	23° 48' 22.996" N	87° 5' 26.468" E
	58	23° 48' 22.267" N	87° 5' 27.482" E
	59	23° 48' 20.901" N	87° 5' 29.036" E
	60	23° 48' 18.059" N	87° 5' 32.270" E
	61	23° 48' 17.868" N	87° 5' 32.482" E
	62	23° 48' 15.890" N	87° 5' 34.678" E
	63	23° 48' 12.318" N	87° 5' 38.644" E
	64	23° 48' 12.239" N	87° 5' 38.732" E
PSBD_JM_AJ_07	1	23° 47' 41.361" N	87° 5' 44.503" E
	2	23° 47' 46.784" N	87° 5' 40.954" E
	3	23° 47' 53.238" N	87° 5' 38.247" E
	4	23° 48' 0.640" N	87° 5' 33.483" E
	5	23° 48' 6.406" N	87° 5' 30.308" E
	6	23° 48' 7.817" N	87° 5' 28.862" E
	7	23° 48' 5.408" N	87° 5' 31.242" E
	8	23° 48' 3.300" N	87° 5' 34.562" E
	9	23° 48' 4.536" N	87° 5' 39.141" E
	10	23° 48' 4.823" N	87° 5' 42.103" E
	11	23° 48' 1.392" N	87° 5' 48.160" E
	12	23° 47' 58.583" N	87° 5' 49.370" E
	13	23° 47' 59.055" N	87° 5' 52.583" E
	14	23° 47' 49.451" N	87° 6' 2.035" E
	15	23° 47' 47.870" N	87° 6' 3.160" E
	16	23° 47' 42.359" N	87° 6' 6.950" E
	17	23° 47' 21.514" N	87° 6' 19.202" E
	18	23° 47' 21.362" N	87° 6' 15.881" E
	19	23° 47' 24.464" N	87° 6' 9.152" E
	20	23° 47' 22.648" N	87° 6' 2.266" E
	21	23° 47' 33.958" N	87° 5' 51.977" E
	22	23° 47' 37.240" N	87° 5' 48.663" E
	23	23° 47' 41.260" N	87° 5' 44.605" E
PSBD_JM_AJ_07_I	1	23° 46' 53.500" N	87° 6' 23.453" E
	2	23° 47' 1.503" N	87° 6' 20.935" E
	3	23° 47' 2.884" N	87° 6' 19.786" E
	4	23° 47' 7.937" N	87° 6' 20.807" E
	5	23° 47' 11.447" N	87° 6' 21.932" E
	6	23° 47' 14.533" N	87° 6' 24.116" E
	7	23° 47' 9.387" N	87° 6' 27.267" E
	8	23° 47' 5.568" N	87° 6' 29.952" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	9	23° 47' 2.803" N	87° 6' 31.746" E
	10	23° 47' 0.417" N	87° 6' 32.850" E
	11	23° 46' 49.123" N	87° 6' 38.590" E
	12	23° 46' 45.260" N	87° 6' 41.038" E
	13	23° 46' 40.699" N	87° 6' 45.388" E
	14	23° 46' 39.245" N	87° 6' 46.774" E
	15	23° 46' 37.282" N	87° 6' 47.867" E
	16	23° 46' 29.457" N	87° 6' 52.897" E
	17	23° 46' 20.016" N	87° 6' 57.353" E
	18	23° 46' 17.791" N	87° 6' 53.870" E
	19	23° 46' 18.446" N	87° 6' 52.262" E
	20	23° 46' 21.132" N	87° 6' 49.722" E
	21	23° 46' 21.471" N	87° 6' 47.924" E
	22	23° 46' 21.478" N	87° 6' 47.920" E
	23	23° 46' 24.836" N	87° 6' 44.651" E
	24	23° 46' 27.419" N	87° 6' 41.101" E
	25	23° 46' 29.612" N	87° 6' 40.097" E
	26	23° 46' 35.271" N	87° 6' 36.553" E
PSBD_JM_AJ_07B_07C	1	23° 45' 55.959" N	87° 7' 10.527" E
	2	23° 45' 54.766" N	87° 7' 10.337" E
	3	23° 45' 56.600" N	87° 7' 6.407" E
	4	23° 46' 0.648" N	87° 7' 0.335" E
	5	23° 46' 7.966" N	87° 6' 54.078" E
	6	23° 46' 11.840" N	87° 6' 50.996" E
	7	23° 46' 14.765" N	87° 6' 51.466" E
	8	23° 46' 15.479" N	87° 6' 51.094" E
	9	23° 46' 15.505" N	87° 6' 51.898" E
	10	23° 46' 15.004" N	87° 6' 52.670" E
	11	23° 46' 12.731" N	87° 6' 54.837" E
	12	23° 46' 9.391" N	87° 6' 57.041" E
	13	23° 46' 6.672" N	87° 6' 58.272" E
	14	23° 46' 6.016" N	87° 7' 0.627" E
	15	23° 46' 5.910" N	87° 7' 3.581" E
	16	23° 46' 4.635" N	87° 7' 6.384" E
	17	23° 46' 3.498" N	87° 7' 7.879" E
	18	23° 45' 58.955" N	87° 7' 8.623" E
	19	23° 45' 57.130" N	87° 7' 9.818" E
PSBD_JM_AJ_07C_07D_7E	1	23° 45' 45.817" N	87° 7' 36.784" E
	2	23° 45' 45.328" N	87° 7' 39.777" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	3	23° 45' 46.838" N	87° 7' 45.088" E
	4	23° 45' 47.337" N	87° 7' 50.062" E
	5	23° 45' 41.823" N	87° 7' 57.334" E
	6	23° 45' 38.378" N	87° 8' 0.831" E
	7	23° 45' 25.440" N	87° 8' 17.163" E
	8	23° 45' 24.270" N	87° 8' 18.487" E
	9	23° 45' 23.880" N	87° 8' 19.211" E
	10	23° 45' 23.782" N	87° 8' 20.235" E
	11	23° 45' 23.710" N	87° 8' 20.544" E
	12	23° 45' 22.157" N	87° 8' 21.194" E
	13	23° 45' 20.395" N	87° 8' 21.372" E
	14	23° 45' 19.570" N	87° 8' 20.354" E
	15	23° 45' 19.702" N	87° 8' 19.344" E
	16	23° 45' 22.215" N	87° 8' 15.452" E
	17	23° 45' 25.394" N	87° 8' 6.162" E
	18	23° 45' 26.107" N	87° 8' 6.310" E
	19	23° 45' 26.054" N	87° 8' 5.390" E
	20	23° 45' 29.626" N	87° 8' 1.439" E
	21	23° 45' 31.521" N	87° 7' 58.263" E
	22	23° 45' 34.536" N	87° 7' 54.714" E
	23	23° 45' 34.970" N	87° 7' 49.947" E
	24	23° 45' 36.781" N	87° 7' 44.995" E
	25	23° 45' 40.615" N	87° 7' 39.494" E
	26	23° 45' 41.552" N	87° 7' 39.647" E
PSBD_JM_AJ_07C_07D_7E_I	1	23° 45' 49.308" N	87° 7' 31.919" E
	2	23° 45' 49.732" N	87° 7' 30.731" E
	3	23° 45' 50.559" N	87° 7' 28.518" E
	4	23° 45' 51.719" N	87° 7' 24.989" E
	5	23° 45' 53.152" N	87° 7' 22.239" E
	6	23° 45' 54.971" N	87° 7' 20.266" E
	7	23° 45' 56.460" N	87° 7' 16.738" E
	8	23° 45' 58.389" N	87° 7' 14.526" E
	9	23° 46' 2.025" N	87° 7' 13.033" E
	10	23° 46' 4.393" N	87° 7' 12.078" E
	11	23° 46' 5.716" N	87° 7' 10.045" E
	12	23° 46' 7.094" N	87° 7' 8.252" E
	13	23° 46' 6.758" N	87° 7' 9.660" E
	14	23° 46' 7.598" N	87° 7' 7.838" E
	15	23° 45' 56.423" N	87° 7' 22.887" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	16	23° 45' 51.806" N	87° 7' 30.361" E
	17	23° 45' 48.535" N	87° 7' 33.052" E
PSBD_JM_AJ_07E	1	23° 44' 58.892" N	87° 9' 11.893" E
	2	23° 44' 58.300" N	87° 9' 11.804" E
	3	23° 44' 58.330" N	87° 9' 11.695" E
	4	23° 45' 1.521" N	87° 9' 3.847" E
	5	23° 45' 5.232" N	87° 8' 52.168" E
	6	23° 45' 8.076" N	87° 8' 46.282" E
	7	23° 45' 10.164" N	87° 8' 43.035" E
	8	23° 45' 11.309" N	87° 8' 42.521" E
	9	23° 45' 12.135" N	87° 8' 42.477" E
	10	23° 45' 13.044" N	87° 8' 42.567" E
	11	23° 45' 13.704" N	87° 8' 43.276" E
	12	23° 45' 13.053" N	87° 8' 46.013" E
	13	23° 45' 12.744" N	87° 8' 47.531" E
	14	23° 45' 12.386" N	87° 8' 50.445" E
	15	23° 45' 12.144" N	87° 8' 51.504" E
	16	23° 45' 11.898" N	87° 8' 52.581" E
	17	23° 45' 10.858" N	87° 8' 55.000" E
	18	23° 45' 9.606" N	87° 8' 58.248" E
	19	23° 45' 8.735" N	87° 9' 0.085" E
	20	23° 45' 8.224" N	87° 9' 1.161" E
	21	23° 45' 6.415" N	87° 9' 6.686" E
	22	23° 45' 5.415" N	87° 9' 9.265" E
	23	23° 45' 4.588" N	87° 9' 10.386" E
	24	23° 45' 3.279" N	87° 9' 11.094" E
	25	23° 45' 1.834" N	87° 9' 11.205" E
	26	23° 45' 0.856" N	87° 9' 11.689" E
PSBD_JM_AJ_08	1	23° 45' 1.631" N	87° 11' 14.889" E
	2	23° 44' 59.062" N	87° 11' 17.148" E
	3	23° 44' 56.557" N	87° 11' 22.373" E
	4	23° 44' 56.322" N	87° 11' 23.552" E
	5	23° 44' 53.761" N	87° 11' 20.740" E
	6	23° 44' 51.103" N	87° 11' 15.353" E
	7	23° 44' 50.971" N	87° 11' 11.603" E
	8	23° 44' 49.853" N	87° 11' 9.495" E
	9	23° 44' 45.563" N	87° 11' 1.408" E
	10	23° 44' 43.768" N	87° 10' 51.778" E
	11	23° 44' 43.745" N	87° 10' 48.960" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	12	23° 44' 44.657" N	87° 10' 38.406" E
	13	23° 44' 44.119" N	87° 10' 36.433" E
	14	23° 44' 44.950" N	87° 10' 28.174" E
	15	23° 44' 47.080" N	87° 10' 13.742" E
	16	23° 44' 48.635" N	87° 10' 8.136" E
	17	23° 44' 51.135" N	87° 10' 3.653" E
	18	23° 44' 52.319" N	87° 10' 3.319" E
	19	23° 44' 52.826" N	87° 10' 12.524" E
	20	23° 45' 1.093" N	87° 10' 25.956" E
	21	23° 45' 5.186" N	87° 10' 31.376" E
	22	23° 45' 5.855" N	87° 10' 33.063" E
	23	23° 45' 5.772" N	87° 10' 38.731" E
	24	23° 45' 5.851" N	87° 10' 44.204" E
	25	23° 45' 6.077" N	87° 10' 48.142" E
	26	23° 45' 3.696" N	87° 10' 55.118" E
	27	23° 45' 3.686" N	87° 10' 55.150" E
	28	23° 45' 6.478" N	87° 11' 2.885" E
	29	23° 45' 6.379" N	87° 11' 7.405" E
PSBD_JM_AJ_08B_08C	1	23° 44' 49.754" N	87° 12' 26.119" E
	2	23° 44' 49.690" N	87° 12' 24.986" E
	3	23° 44' 50.449" N	87° 12' 23.851" E
	4	23° 44' 52.002" N	87° 12' 20.676" E
	5	23° 44' 53.215" N	87° 12' 14.509" E
	6	23° 44' 55.206" N	87° 12' 4.979" E
	7	23° 44' 56.197" N	87° 11' 57.234" E
	8	23° 44' 56.399" N	87° 11' 57.237" E
	9	23° 44' 57.512" N	87° 11' 58.719" E
	10	23° 44' 57.467" N	87° 12' 1.815" E
	11	23° 44' 57.131" N	87° 12' 6.076" E
	12	23° 44' 55.888" N	87° 12' 8.945" E
	13	23° 44' 55.016" N	87° 12' 12.982" E
	14	23° 44' 54.970" N	87° 12' 16.795" E
	15	23° 44' 53.684" N	87° 12' 20.696" E
	16	23° 44' 52.689" N	87° 12' 23.925" E
	17	23° 44' 52.149" N	87° 12' 25.808" E
	18	23° 44' 50.827" N	87° 12' 26.390" E
PSBD_JM_AJ_08D	1	23° 44' 44.432" N	87° 12' 52.624" E
	2	23° 44' 43.106" N	87° 12' 55.493" E
	3	23° 44' 43.558" N	87° 13' 0.458" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	4	23° 44' 43.294" N	87° 13' 1.256" E
	5	23° 44' 43.042" N	87° 13' 2.103" E
	6	23° 44' 42.790" N	87° 13' 2.951" E
	7	23° 44' 42.595" N	87° 13' 3.427" E
	8	23° 44' 41.879" N	87° 13' 4.362" E
	9	23° 44' 40.529" N	87° 13' 5.227" E
	10	23° 44' 40.456" N	87° 13' 5.280" E
	11	23° 44' 39.790" N	87° 13' 4.416" E
	12	23° 44' 39.960" N	87° 13' 0.872" E
	13	23° 44' 39.965" N	87° 12' 57.372" E
	14	23° 44' 40.680" N	87° 12' 53.775" E
	15	23° 44' 41.915" N	87° 12' 50.915" E
	16	23° 44' 43.364" N	87° 12' 48.361" E
	17	23° 44' 44.070" N	87° 12' 45.177" E
	18	23° 44' 45.023" N	87° 12' 43.069" E
	19	23° 44' 46.945" N	87° 12' 42.820" E
	20	23° 44' 47.756" N	87° 12' 43.311" E
	21	23° 44' 47.786" N	87° 12' 45.676" E
	22	23° 44' 46.502" N	87° 12' 48.321" E
PSBD_JM_AJ_08D_I	1	23° 44' 34.314" N	87° 12' 52.339" E
	2	23° 44' 34.192" N	87° 12' 51.862" E
	3	23° 44' 35.703" N	87° 12' 48.876" E
	4	23° 44' 39.155" N	87° 12' 40.844" E
	5	23° 44' 42.607" N	87° 12' 33.092" E
	6	23° 44' 44.504" N	87° 12' 30.198" E
	7	23° 44' 46.626" N	87° 12' 28.589" E
	8	23° 44' 46.609" N	87° 12' 30.331" E
	9	23° 44' 45.240" N	87° 12' 35.174" E
	10	23° 44' 43.624" N	87° 12' 39.433" E
	11	23° 44' 42.340" N	87° 12' 42.123" E
	12	23° 44' 40.478" N	87° 12' 44.318" E
	13	23° 44' 39.154" N	87° 12' 46.739" E
	14	23° 44' 37.744" N	87° 12' 50.595" E
	15	23° 44' 36.750" N	87° 12' 52.701" E
PSBD_JM_AJ_08E_1	1	23° 44' 25.260" N	87° 13' 12.378" E
	2	23° 44' 25.158" N	87° 13' 12.553" E
	3	23° 44' 25.335" N	87° 13' 12.198" E
	4	23° 44' 32.310" N	87° 13' 18.323" E
	5	23° 44' 30.491" N	87° 13' 19.546" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	6	23° 44' 29.030" N	87° 13' 20.531" E
	7	23° 44' 28.597" N	87° 13' 20.963" E
	8	23° 44' 27.745" N	87° 13' 21.814" E
	9	23° 44' 27.289" N	87° 13' 23.685" E
	10	23° 44' 27.033" N	87° 13' 24.542" E
	11	23° 44' 26.989" N	87° 13' 24.687" E
	12	23° 44' 26.814" N	87° 13' 25.275" E
	13	23° 44' 26.230" N	87° 13' 27.233" E
	14	23° 44' 24.814" N	87° 13' 30.921" E
	15	23° 44' 24.585" N	87° 13' 32.775" E
	16	23° 44' 24.633" N	87° 13' 34.646" E
	17	23° 44' 24.908" N	87° 13' 36.589" E
	18	23° 44' 25.864" N	87° 13' 40.010" E
	19	23° 44' 25.190" N	87° 13' 41.469" E
	20	23° 44' 24.540" N	87° 13' 41.005" E
	21	23° 44' 24.531" N	87° 13' 40.635" E
	22	23° 44' 22.984" N	87° 13' 38.950" E
	23	23° 44' 21.958" N	87° 13' 35.116" E
	24	23° 44' 21.276" N	87° 13' 30.629" E
	25	23° 44' 21.717" N	87° 13' 23.247" E
	26	23° 44' 23.013" N	87° 13' 19.417" E
	27	23° 44' 25.773" N	87° 13' 14.655" E
	28	23° 44' 27.413" N	87° 13' 10.639" E
	29	23° 44' 28.368" N	87° 13' 4.566" E
	30	23° 44' 29.080" N	87° 13' 2.131" E
	31	23° 44' 29.817" N	87° 13' 2.298" E
	32	23° 44' 31.005" N	87° 13' 2.227" E
	33	23° 44' 30.505" N	87° 12' 59.645" E
	34	23° 44' 31.789" N	87° 12' 56.731" E
	35	23° 44' 33.558" N	87° 12' 55.558" E
	36	23° 44' 35.632" N	87° 12' 55.257" E
	37	23° 44' 37.572" N	87° 12' 55.484" E
	38	23° 44' 38.149" N	87° 12' 56.158" E
	39	23° 44' 38.144" N	87° 12' 59.747" E
	40	23° 44' 38.077" N	87° 13' 4.549" E
	41	23° 44' 38.041" N	87° 13' 7.042" E
	42	23° 44' 37.652" N	87° 13' 7.326" E
	43	23° 44' 36.893" N	87° 13' 8.730" E
	44	23° 44' 34.545" N	87° 13' 14.618" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	45	23° 44' 34.449" N	87° 13' 14.798" E
	46	23° 44' 33.303" N	87° 13' 16.949" E
PSBD_PB_AJ_09_10	1	23° 44' 40.757" N	87° 14' 38.903" E
	2	23° 44' 40.728" N	87° 14' 39.199" E
	3	23° 44' 40.693" N	87° 14' 39.560" E
	4	23° 44' 43.533" N	87° 14' 38.978" E
	5	23° 44' 44.751" N	87° 14' 55.660" E
	6	23° 44' 45.063" N	87° 14' 56.093" E
	7	23° 44' 45.345" N	87° 14' 56.483" E
	8	23° 44' 46.187" N	87° 14' 57.650" E
	9	23° 44' 46.786" N	87° 14' 58.479" E
	10	23° 44' 46.980" N	87° 14' 58.747" E
	11	23° 44' 47.025" N	87° 14' 58.835" E
	12	23° 44' 47.615" N	87° 14' 59.970" E
	13	23° 44' 48.510" N	87° 15' 1.695" E
	14	23° 44' 50.740" N	87° 15' 6.248" E
	15	23° 44' 51.766" N	87° 15' 8.807" E
	16	23° 44' 51.855" N	87° 15' 9.131" E
	17	23° 44' 52.046" N	87° 15' 10.597" E
	18	23° 44' 50.578" N	87° 15' 24.054" E
	19	23° 44' 49.011" N	87° 15' 34.818" E
	20	23° 44' 42.795" N	87° 15' 48.040" E
	21	23° 44' 36.406" N	87° 16' 0.059" E
	22	23° 44' 36.882" N	87° 15' 52.083" E
	23	23° 44' 37.043" N	87° 15' 46.661" E
	24	23° 44' 36.488" N	87° 15' 41.316" E
	25	23° 44' 35.945" N	87° 15' 36.828" E
	26	23° 44' 33.331" N	87° 15' 35.702" E
	27	23° 44' 32.580" N	87° 15' 32.261" E
	28	23° 44' 33.965" N	87° 15' 27.254" E
	29	23° 44' 34.109" N	87° 15' 23.516" E
	30	23° 44' 32.831" N	87° 15' 20.610" E
	31	23° 44' 33.326" N	87° 15' 17.945" E
	32	23° 44' 34.723" N	87° 15' 5.704" E
	33	23° 44' 36.119" N	87° 14' 53.463" E
	34	23° 44' 36.096" N	87° 14' 51.459" E
	35	23° 44' 36.136" N	87° 14' 51.451" E
	36	23° 44' 36.996" N	87° 14' 48.587" E
	37	23° 44' 37.481" N	87° 14' 46.868" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	38	23° 44' 38.392" N	87° 14' 44.867" E
	39	23° 44' 38.898" N	87° 14' 42.945" E
	40	23° 44' 39.486" N	87° 14' 40.928" E
PSBD_PB_AJ_10	1	23° 44' 25.621" N	87° 16' 16.360" E
	2	23° 44' 23.353" N	87° 16' 14.486" E
	3	23° 44' 24.244" N	87° 16' 8.432" E
	4	23° 44' 27.502" N	87° 16' 3.355" E
	5	23° 44' 29.917" N	87° 16' 0.000" E
	6	23° 44' 32.600" N	87° 16' 0.598" E
	7	23° 44' 33.546" N	87° 16' 5.437" E
	8	23° 44' 33.265" N	87° 16' 5.966" E
	9	23° 44' 27.879" N	87° 16' 16.048" E
	10	23° 44' 27.752" N	87° 16' 16.325" E
PSBD_PB_AJ_10A_I	1	23° 43' 5.652" N	87° 19' 12.095" E
	2	23° 43' 5.106" N	87° 19' 9.702" E
	3	23° 43' 6.218" N	87° 19' 4.322" E
	4	23° 43' 8.224" N	87° 18' 59.468" E
	5	23° 43' 11.467" N	87° 18' 55.513" E
	6	23° 43' 14.849" N	87° 18' 50.737" E
	7	23° 43' 17.672" N	87° 18' 50.445" E
	8	23° 43' 18.357" N	87° 18' 52.091" E
	9	23° 43' 17.237" N	87° 19' 1.134" E
	10	23° 43' 15.024" N	87° 19' 6.362" E
	11	23° 43' 12.126" N	87° 19' 9.644" E
	12	23° 43' 8.818" N	87° 19' 11.729" E
PSBD_FR_AJ_10A_II	1	23° 42' 59.974" N	87° 19' 28.079" E
	2	23° 42' 59.190" N	87° 19' 23.646" E
	3	23° 42' 59.526" N	87° 19' 21.208" E
	4	23° 43' 0.338" N	87° 19' 18.810" E
	5	23° 43' 0.754" N	87° 19' 18.388" E
	6	23° 43' 2.545" N	87° 19' 16.573" E
	7	23° 43' 4.610" N	87° 19' 16.727" E
	8	23° 43' 5.290" N	87° 19' 20.467" E
	9	23° 43' 5.331" N	87° 19' 20.811" E
	10	23° 43' 5.831" N	87° 19' 25.028" E
	11	23° 43' 6.372" N	87° 19' 29.515" E
	12	23° 43' 7.155" N	87° 19' 37.356" E
	13	23° 43' 6.830" N	87° 19' 38.338" E
	14	23° 43' 6.258" N	87° 19' 39.844" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	15	23° 43' 5.407" N	87° 19' 42.083" E
	16	23° 43' 5.124" N	87° 19' 42.827" E
	17	23° 43' 4.350" N	87° 19' 41.845" E
	18	23° 43' 2.707" N	87° 19' 37.878" E
	19	23° 43' 1.339" N	87° 19' 33.764" E
PSBD_FR_AJ_10B_I	1	23° 43' 8.540" N	87° 20' 2.591" E
	2	23° 43' 8.771" N	87° 20' 3.046" E
	3	23° 43' 13.871" N	87° 20' 16.102" E
	4	23° 43' 15.457" N	87° 20' 19.355" E
	5	23° 43' 13.837" N	87° 20' 18.412" E
	6	23° 43' 12.331" N	87° 20' 14.894" E
	7	23° 43' 11.785" N	87° 20' 12.800" E
	8	23° 43' 10.620" N	87° 20' 10.255" E
	9	23° 43' 9.248" N	87° 20' 8.233" E
	10	23° 43' 7.532" N	87° 20' 6.210" E
	11	23° 43' 6.300" N	87° 20' 3.379" E
	12	23° 43' 5.334" N	87° 20' 4.423" E
	13	23° 43' 4.505" N	87° 20' 5.991" E
	14	23° 43' 2.954" N	87° 20' 5.882" E
	15	23° 43' 0.563" N	87° 19' 58.656" E
	16	23° 43' 0.316" N	87° 19' 54.891" E
	17	23° 43' 1.501" N	87° 19' 54.845" E
	18	23° 43' 2.598" N	87° 19' 56.567" E
	19	23° 43' 3.700" N	87° 19' 56.121" E
	20	23° 43' 4.396" N	87° 19' 55.103" E
	21	23° 43' 4.966" N	87° 19' 56.017" E
	22	23° 43' 7.243" N	87° 20' 0.041" E
	23	23° 43' 8.017" N	87° 20' 1.563" E
	24	23° 43' 8.493" N	87° 20' 2.499" E
PSBD_FR_AJ_10C_I	1	23° 43' 8.999" N	87° 21' 22.759" E
	2	23° 43' 8.882" N	87° 21' 22.869" E
	3	23° 43' 4.332" N	87° 21' 23.437" E
	4	23° 43' 2.660" N	87° 21' 23.519" E
	5	23° 43' 1.967" N	87° 21' 22.597" E
	6	23° 43' 0.616" N	87° 21' 21.023" E
	7	23° 43' 2.142" N	87° 21' 17.899" E
	8	23° 43' 3.387" N	87° 21' 15.137" E
	9	23° 43' 5.529" N	87° 21' 11.853" E
	10	23° 43' 7.873" N	87° 21' 9.991" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	11	23° 43' 8.980" N	87° 21' 7.377" E
	12	23° 43' 8.987" N	87° 21' 4.462" E
	13	23° 43' 10.164" N	87° 21' 1.400" E
	14	23° 43' 12.305" N	87° 20' 58.266" E
	15	23° 43' 14.094" N	87° 20' 58.345" E
	16	23° 43' 14.671" N	87° 21' 3.253" E
	17	23° 43' 14.485" N	87° 21' 4.388" E
	18	23° 43' 14.410" N	87° 21' 4.845" E
	19	23° 43' 14.359" N	87° 21' 5.152" E
	20	23° 43' 13.239" N	87° 21' 11.972" E
	21	23° 43' 11.956" N	87° 21' 17.286" E
	22	23° 43' 11.420" N	87° 21' 18.733" E
PSBD_FR_AJ_10C_II	1	23° 43' 4.548" N	87° 21' 26.269" E
	2	23° 43' 3.629" N	87° 21' 24.869" E
	3	23° 43' 4.810" N	87° 21' 24.933" E
	4	23° 43' 6.437" N	87° 21' 25.185" E
	5	23° 43' 6.022" N	87° 21' 25.578" E
	6	23° 43' 4.809" N	87° 21' 26.728" E
PSBD_KN_AJ_10D_I	1	23° 41' 22.603" N	87° 24' 26.909" E
	2	23° 41' 11.384" N	87° 24' 46.421" E
	3	23° 41' 10.086" N	87° 24' 48.037" E
	4	23° 41' 2.895" N	87° 24' 50.215" E
	5	23° 40' 58.782" N	87° 24' 45.068" E
	6	23° 41' 1.671" N	87° 24' 42.409" E
	7	23° 41' 5.898" N	87° 24' 37.412" E
	8	23° 41' 12.098" N	87° 24' 35.376" E
	9	23° 41' 15.979" N	87° 24' 33.128" E
PSBD_KN_AJ_11	1	23° 40' 12.533" N	87° 24' 47.313" E
	2	23° 40' 18.027" N	87° 24' 50.713" E
	3	23° 40' 28.424" N	87° 24' 55.510" E
	4	23° 40' 31.664" N	87° 24' 56.100" E
	5	23° 40' 33.362" N	87° 24' 56.945" E
	6	23° 40' 35.558" N	87° 24' 56.809" E
	7	23° 40' 39.953" N	87° 24' 55.547" E
	8	23° 40' 41.433" N	87° 24' 54.684" E
	9	23° 40' 43.092" N	87° 24' 55.757" E
	10	23° 40' 46.449" N	87° 24' 55.394" E
	11	23° 40' 48.948" N	87° 24' 53.908" E
	12	23° 40' 50.072" N	87° 24' 51.576" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	13	23° 40' 54.113" N	87° 24' 52.709" E
	14	23° 41' 3.054" N	87° 24' 52.196" E
	15	23° 41' 3.382" N	87° 24' 53.154" E
	16	23° 41' 2.774" N	87° 24' 53.992" E
	17	23° 40' 44.111" N	87° 25' 2.006" E
	18	23° 40' 42.729" N	87° 25' 2.411" E
	19	23° 40' 40.811" N	87° 25' 2.676" E
	20	23° 40' 39.511" N	87° 25' 2.463" E
	21	23° 40' 35.920" N	87° 25' 1.386" E
	22	23° 40' 31.888" N	87° 25' 0.016" E
	23	23° 40' 28.267" N	87° 24' 58.973" E
	24	23° 40' 27.708" N	87° 24' 58.793" E
	25	23° 40' 25.972" N	87° 24' 57.512" E
	26	23° 40' 14.554" N	87° 24' 52.693" E
	27	23° 40' 12.479" N	87° 24' 50.056" E
	28	23° 40' 10.591" N	87° 24' 48.369" E
	29	23° 40' 7.987" N	87° 24' 44.477" E
PSBD_KN_AJ_12	1	23° 36' 46.975" N	87° 28' 15.365" E
	2	23° 36' 45.501" N	87° 28' 14.137" E
	3	23° 36' 44.682" N	87° 28' 12.042" E
	4	23° 36' 45.463" N	87° 28' 8.699" E
	5	23° 36' 45.471" N	87° 28' 6.069" E
	6	23° 36' 46.478" N	87° 28' 0.874" E
	7	23° 36' 46.315" N	87° 27' 59.858" E
	8	23° 36' 47.745" N	87° 27' 59.369" E
	9	23° 36' 48.178" N	87° 28' 2.951" E
	10	23° 36' 48.260" N	87° 28' 5.059" E
	11	23° 36' 46.978" N	87° 28' 7.527" E
	12	23° 36' 46.694" N	87° 28' 11.478" E
PSBD_KN_AJ_12A_I	1	23° 36' 44.146" N	87° 27' 37.287" E
	2	23° 36' 41.242" N	87° 27' 37.774" E
	3	23° 36' 38.887" N	87° 27' 27.068" E
	4	23° 36' 37.688" N	87° 27' 23.720" E
	5	23° 36' 38.509" N	87° 27' 18.420" E
	6	23° 36' 37.810" N	87° 27' 13.406" E
	7	23° 36' 38.762" N	87° 27' 10.822" E
	8	23° 36' 39.036" N	87° 27' 8.718" E
	9	23° 36' 39.089" N	87° 27' 8.562" E
	10	23° 36' 41.247" N	87° 27' 5.044" E

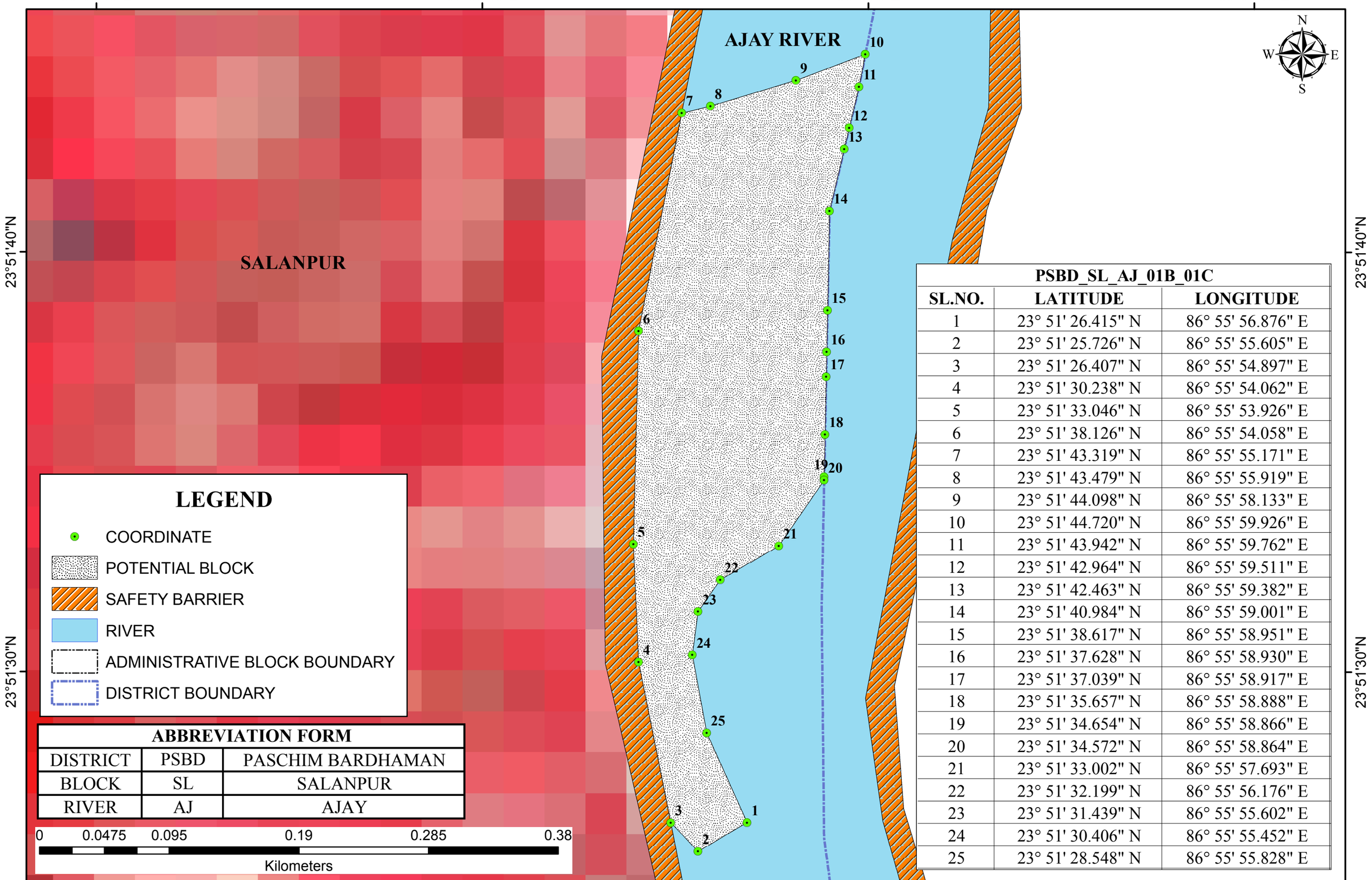
SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	11	23° 36' 44.144" N	87° 27' 1.222" E
	12	23° 36' 43.687" N	87° 27' 2.836" E
	13	23° 36' 42.797" N	87° 27' 5.977" E
	14	23° 36' 41.950" N	87° 27' 10.245" E
	15	23° 36' 41.721" N	87° 27' 13.614" E
	16	23° 36' 41.720" N	87° 27' 14.964" E
	17	23° 36' 41.720" N	87° 27' 15.203" E
	18	23° 36' 41.719" N	87° 27' 17.371" E
	19	23° 36' 41.715" N	87° 27' 17.419" E
	20	23° 36' 41.473" N	87° 27' 20.863" E
	21	23° 36' 41.439" N	87° 27' 23.085" E
	22	23° 36' 41.454" N	87° 27' 23.240" E
	23	23° 36' 41.746" N	87° 27' 26.295" E
	24	23° 36' 42.834" N	87° 27' 29.312" E
	25	23° 36' 43.011" N	87° 27' 31.482" E
	26	23° 36' 43.565" N	87° 27' 34.232" E
	27	23° 36' 43.952" N	87° 27' 36.156" E
	28	23° 36' 44.143" N	87° 27' 37.267" E
PSBD_KN_AJ_12B	1	23° 36' 47.848" N	87° 28' 16.093" E
	2	23° 36' 45.501" N	87° 28' 14.137" E
	3	23° 36' 44.682" N	87° 28' 12.042" E
	4	23° 36' 45.463" N	87° 28' 8.699" E
	5	23° 36' 45.471" N	87° 28' 6.069" E
	6	23° 36' 45.863" N	87° 28' 3.860" E
	7	23° 36' 46.478" N	87° 28' 0.874" E
	8	23° 36' 46.315" N	87° 27' 59.858" E
	9	23° 36' 47.745" N	87° 27' 59.369" E
	10	23° 36' 48.178" N	87° 28' 2.951" E
	11	23° 36' 48.234" N	87° 28' 4.386" E
	12	23° 36' 48.299" N	87° 28' 6.073" E
	13	23° 36' 48.499" N	87° 28' 11.241" E
	14	23° 36' 48.460" N	87° 28' 11.749" E
	15	23° 36' 48.335" N	87° 28' 13.393" E
PSBD_KN_AJ_13	1	23° 36' 30.919" N	87° 30' 41.595" E
	2	23° 36' 30.315" N	87° 30' 43.343" E
	3	23° 36' 30.478" N	87° 30' 45.771" E
	4	23° 36' 26.171" N	87° 30' 44.272" E
	5	23° 36' 26.160" N	87° 30' 42.955" E
	6	23° 36' 26.096" N	87° 30' 42.946" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	7	23° 36' 23.869" N	87° 30' 41.413" E
	8	23° 36' 24.380" N	87° 30' 39.735" E
	9	23° 36' 22.719" N	87° 30' 37.643" E
	10	23° 36' 22.990" N	87° 30' 36.546" E
	11	23° 36' 30.919" N	87° 30' 41.595" E
	12	23° 36' 30.919" N	87° 30' 41.595" E
	13	23° 36' 31.242" N	87° 30' 41.796" E
	14	23° 36' 30.919" N	87° 30' 41.595" E
	15	23° 36' 36.395" N	87° 30' 43.309" E
	16	23° 36' 37.623" N	87° 30' 43.344" E
	17	23° 36' 40.523" N	87° 30' 43.428" E
	18	23° 36' 42.298" N	87° 30' 43.658" E
	19	23° 36' 47.371" N	87° 30' 46.087" E
	20	23° 36' 44.761" N	87° 30' 45.808" E
	21	23° 36' 43.315" N	87° 30' 46.027" E
	22	23° 36' 41.666" N	87° 30' 45.180" E
	23	23° 36' 39.241" N	87° 30' 44.722" E
	24	23° 36' 38.724" N	87° 30' 45.112" E
	25	23° 36' 35.687" N	87° 30' 44.789" E
	26	23° 36' 32.938" N	87° 30' 43.471" E
	27	23° 36' 31.358" N	87° 30' 41.830" E
	28	23° 36' 34.110" N	87° 30' 42.638" E
	29	23° 36' 36.395" N	87° 30' 43.309" E
PSBD_KN_AJ_13_I	1	23° 36' 50.669" N	87° 31' 11.361" E
	2	23° 36' 50.612" N	87° 31' 7.357" E
	3	23° 36' 49.943" N	87° 31' 1.603" E
	4	23° 36' 48.925" N	87° 30' 58.075" E
	5	23° 36' 48.560" N	87° 30' 56.808" E
	6	23° 36' 48.459" N	87° 30' 55.309" E
	7	23° 36' 49.397" N	87° 30' 54.596" E
	8	23° 36' 51.104" N	87° 30' 54.423" E
	9	23° 36' 54.018" N	87° 30' 55.988" E
	10	23° 36' 55.773" N	87° 30' 58.027" E
	11	23° 36' 56.978" N	87° 30' 59.764" E
	12	23° 36' 57.739" N	87° 31' 2.815" E
	13	23° 36' 57.344" N	87° 31' 5.562" E
	14	23° 36' 56.399" N	87° 31' 8.247" E
	15	23° 36' 54.560" N	87° 31' 11.469" E
	16	23° 36' 54.182" N	87° 31' 13.687" E

SANDBAR CODE	SL.NO.	LATITUDE	LONGITUDE
	17	23° 36' 50.767" N	87° 31' 13.644" E
DAMODAR SANDBAR			
PSBD_AN_DA_01	1	23° 34' 23.911" N	87° 8' 15.487" E
	2	23° 34' 23.664" N	87° 8' 22.021" E
	3	23° 34' 21.044" N	87° 8' 27.731" E
	4	23° 34' 21.028" N	87° 8' 32.640" E
	5	23° 34' 20.762" N	87° 8' 38.791" E
	6	23° 34' 20.513" N	87° 8' 47.229" E
	7	23° 34' 18.649" N	87° 8' 53.350" E
	8	23° 34' 16.685" N	87° 8' 55.700" E
	9	23° 34' 14.476" N	87° 9' 1.970" E
	10	23° 34' 12.235" N	87° 9' 6.261" E
	11	23° 34' 8.927" N	87° 9' 10.327" E
	12	23° 34' 3.799" N	87° 9' 19.750" E
	13	23° 33' 51.526" N	87° 9' 57.373" E
	14	23° 33' 51.115" N	87° 10' 9.759" E
	15	23° 33' 46.442" N	87° 10' 4.977" E
	16	23° 33' 43.763" N	87° 9' 55.640" E
	17	23° 33' 47.556" N	87° 9' 27.644" E
	18	23° 33' 57.049" N	87° 8' 58.138" E
	19	23° 34' 2.798" N	87° 8' 52.449" E
	20	23° 34' 5.074" N	87° 8' 48.195" E
	21	23° 34' 7.022" N	87° 8' 27.344" E
	22	23° 34' 6.555" N	87° 8' 24.970" E
	23	23° 34' 8.055" N	87° 8' 19.508" E
	24	23° 34' 27.927" N	87° 7' 53.770" E

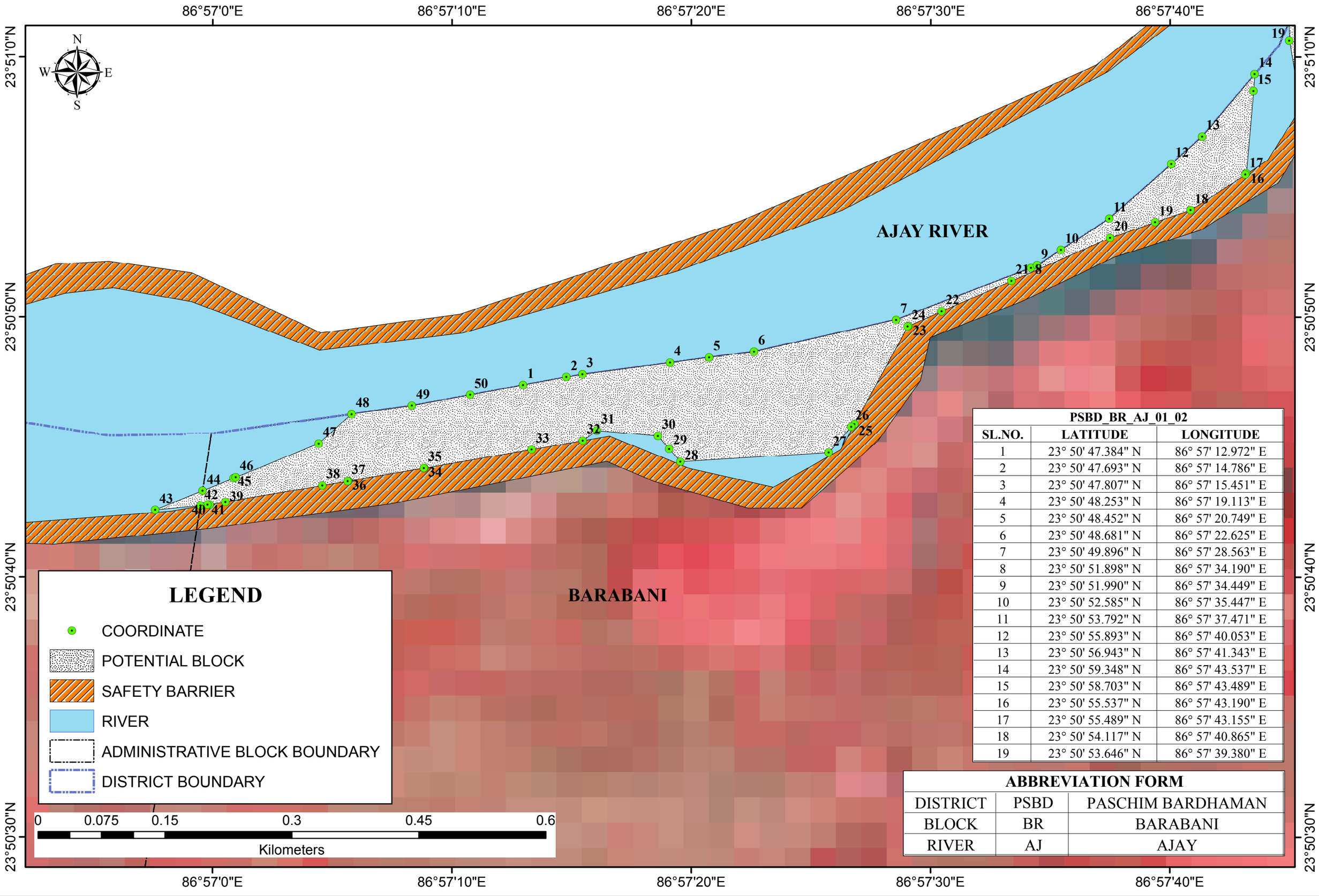
Annexure 4
Map showing of Potential Blocks of Paschim Bardhaman District

POTENTIAL BLOCK PSBD_SL_AJ_01B_01C OF AJAY RIVER



PSBD_SL_AJ_01B_01C		
SL.NO.	LATITUDE	LONGITUDE
1	23° 51' 26.415" N	86° 55' 56.876" E
2	23° 51' 25.726" N	86° 55' 55.605" E
3	23° 51' 26.407" N	86° 55' 54.897" E
4	23° 51' 30.238" N	86° 55' 54.062" E
5	23° 51' 33.046" N	86° 55' 53.926" E
6	23° 51' 38.126" N	86° 55' 54.058" E
7	23° 51' 43.319" N	86° 55' 55.171" E
8	23° 51' 43.479" N	86° 55' 55.919" E
9	23° 51' 44.098" N	86° 55' 58.133" E
10	23° 51' 44.720" N	86° 55' 59.926" E
11	23° 51' 43.942" N	86° 55' 59.762" E
12	23° 51' 42.964" N	86° 55' 59.511" E
13	23° 51' 42.463" N	86° 55' 59.382" E
14	23° 51' 40.984" N	86° 55' 59.001" E
15	23° 51' 38.617" N	86° 55' 58.951" E
16	23° 51' 37.628" N	86° 55' 58.930" E
17	23° 51' 37.039" N	86° 55' 58.917" E
18	23° 51' 35.657" N	86° 55' 58.888" E
19	23° 51' 34.654" N	86° 55' 58.866" E
20	23° 51' 34.572" N	86° 55' 58.864" E
21	23° 51' 33.002" N	86° 55' 57.693" E
22	23° 51' 32.199" N	86° 55' 56.176" E
23	23° 51' 31.439" N	86° 55' 55.602" E
24	23° 51' 30.406" N	86° 55' 55.452" E
25	23° 51' 28.548" N	86° 55' 55.828" E

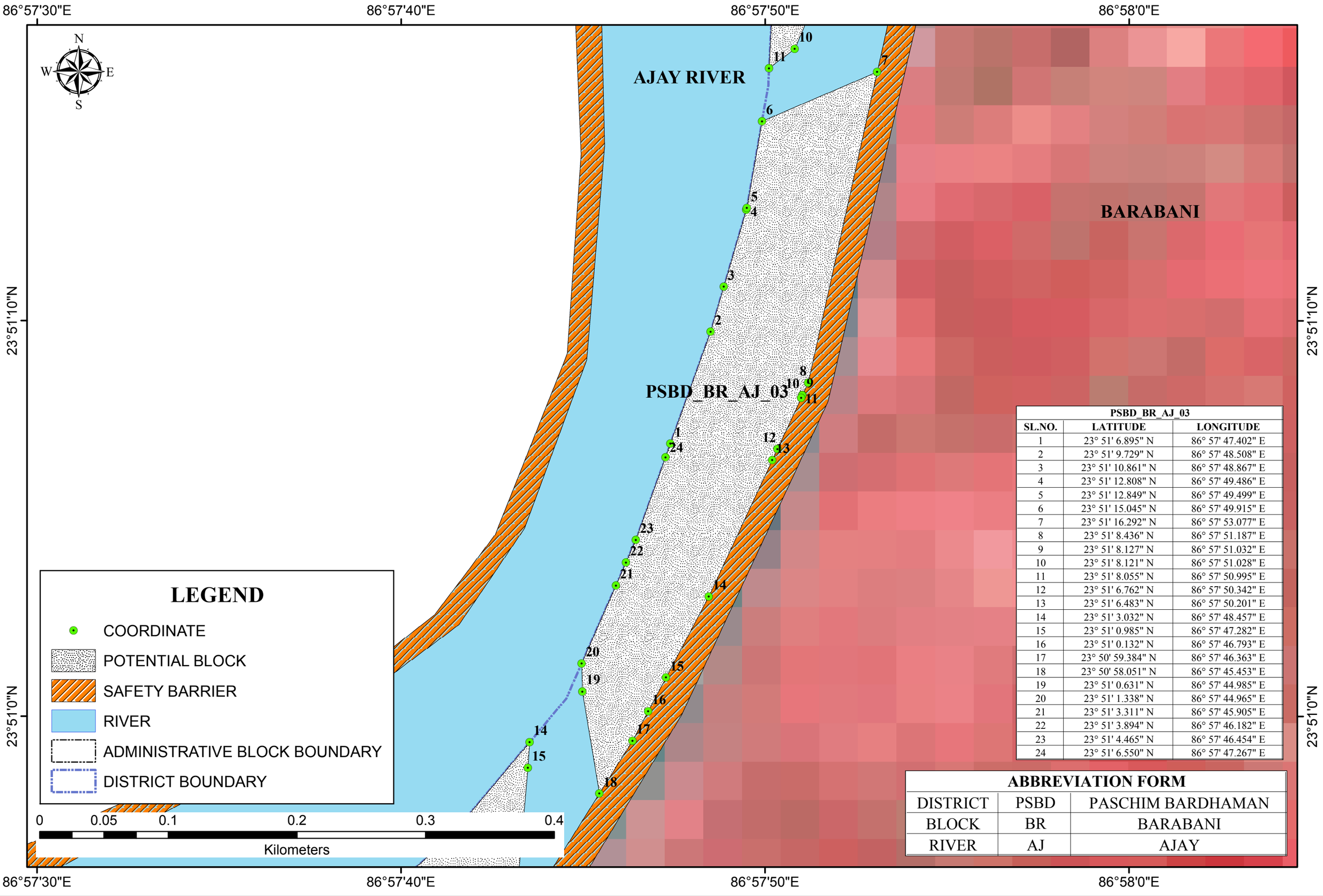
POTENTIAL BLOCK PSBD_BR_AJ_01_02 OF AJAY RIVER



PSBD_BR_AJ_01_02		
SL.NO.	LATITUDE	LONGITUDE
1	23° 50' 47.384" N	86° 57' 12.972" E
2	23° 50' 47.693" N	86° 57' 14.786" E
3	23° 50' 47.807" N	86° 57' 15.451" E
4	23° 50' 48.253" N	86° 57' 19.113" E
5	23° 50' 48.452" N	86° 57' 20.749" E
6	23° 50' 48.681" N	86° 57' 22.625" E
7	23° 50' 49.896" N	86° 57' 28.563" E
8	23° 50' 51.898" N	86° 57' 34.190" E
9	23° 50' 51.990" N	86° 57' 34.449" E
10	23° 50' 52.585" N	86° 57' 35.447" E
11	23° 50' 53.792" N	86° 57' 37.471" E
12	23° 50' 55.893" N	86° 57' 40.053" E
13	23° 50' 56.943" N	86° 57' 41.343" E
14	23° 50' 59.348" N	86° 57' 43.537" E
15	23° 50' 58.703" N	86° 57' 43.489" E
16	23° 50' 55.537" N	86° 57' 43.190" E
17	23° 50' 55.489" N	86° 57' 43.155" E
18	23° 50' 54.117" N	86° 57' 40.865" E
19	23° 50' 53.646" N	86° 57' 39.380" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

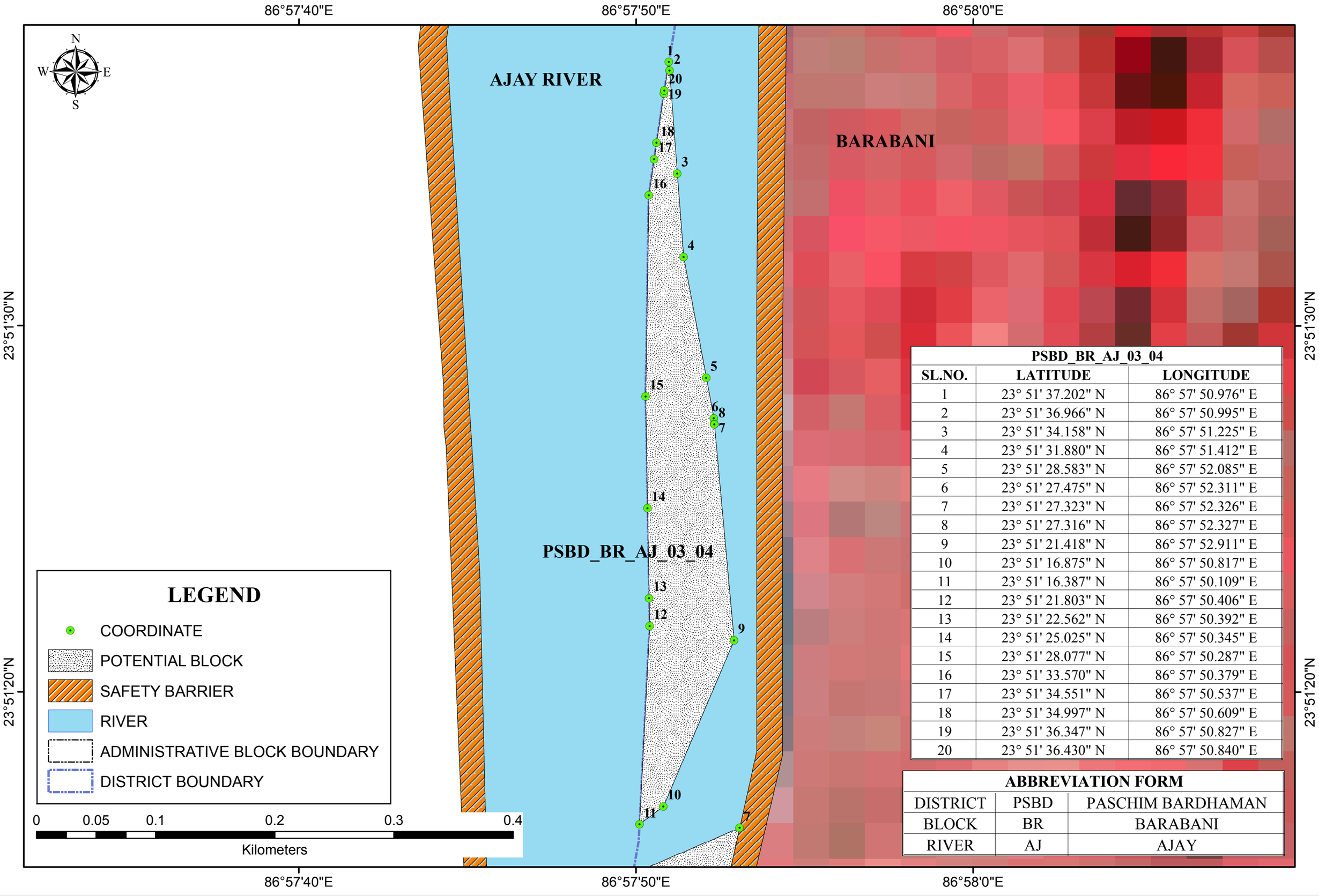
POTENTIAL BLOCK PSBD_BR_AJ_03 OF AJAY RIVER



PSBD_BR_AJ_03		
SL.NO.	LATITUDE	LONGITUDE
1	23° 51' 6.895" N	86° 57' 47.402" E
2	23° 51' 9.729" N	86° 57' 48.508" E
3	23° 51' 10.861" N	86° 57' 48.867" E
4	23° 51' 12.808" N	86° 57' 49.486" E
5	23° 51' 12.849" N	86° 57' 49.499" E
6	23° 51' 15.045" N	86° 57' 49.915" E
7	23° 51' 16.292" N	86° 57' 53.077" E
8	23° 51' 8.436" N	86° 57' 51.187" E
9	23° 51' 8.127" N	86° 57' 51.032" E
10	23° 51' 8.121" N	86° 57' 51.028" E
11	23° 51' 8.055" N	86° 57' 50.995" E
12	23° 51' 6.762" N	86° 57' 50.342" E
13	23° 51' 6.483" N	86° 57' 50.201" E
14	23° 51' 3.032" N	86° 57' 48.457" E
15	23° 51' 0.985" N	86° 57' 47.282" E
16	23° 51' 0.132" N	86° 57' 46.793" E
17	23° 50' 59.384" N	86° 57' 46.363" E
18	23° 50' 58.051" N	86° 57' 45.453" E
19	23° 51' 0.631" N	86° 57' 44.985" E
20	23° 51' 1.338" N	86° 57' 44.965" E
21	23° 51' 3.311" N	86° 57' 45.905" E
22	23° 51' 3.894" N	86° 57' 46.182" E
23	23° 51' 4.465" N	86° 57' 46.454" E
24	23° 51' 6.550" N	86° 57' 47.267" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

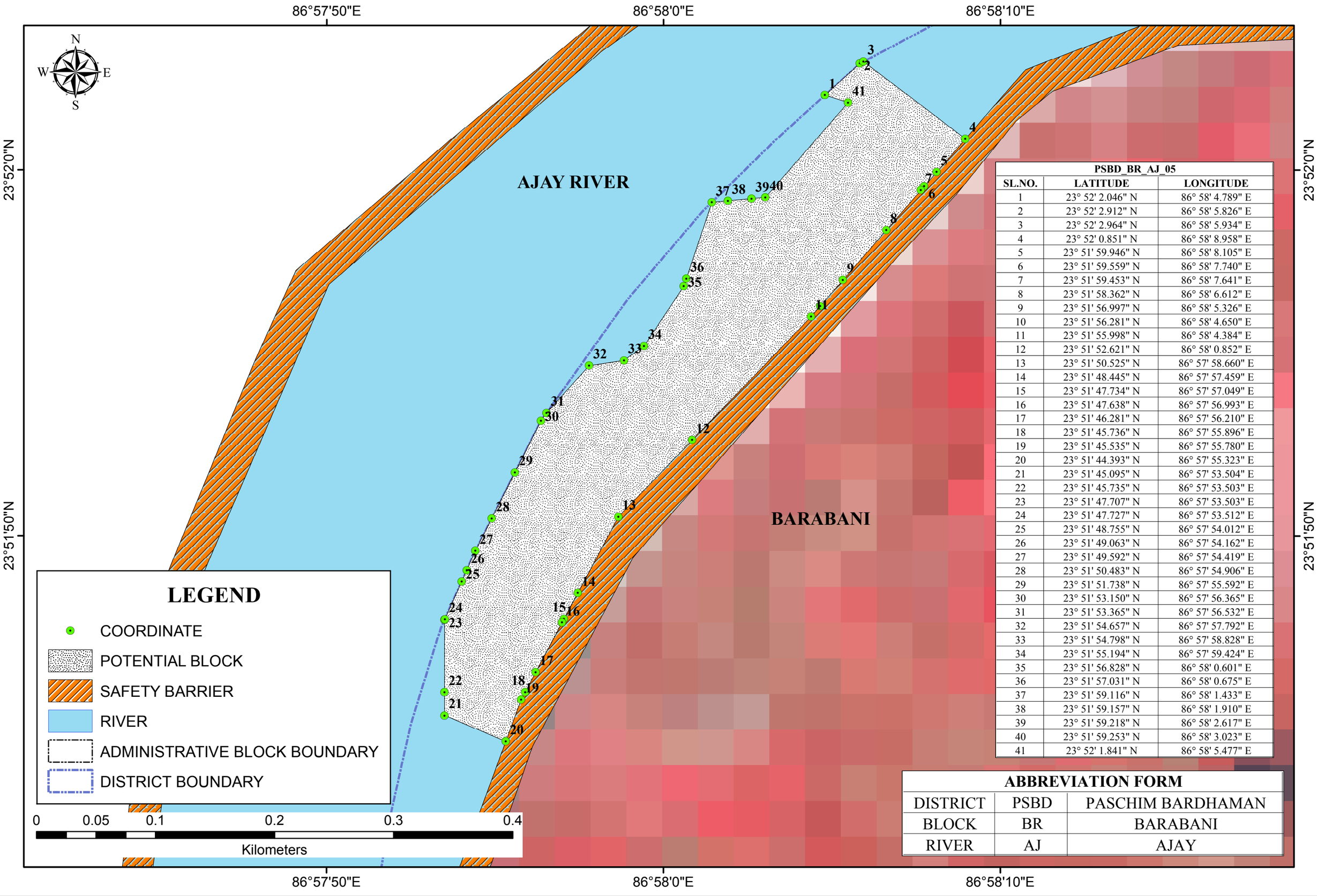
POTENTIAL BLOCK PSBD_BR_AJ_03_04 OF AJAY RIVER



PSBD_BR_AJ_03_04		
SL.NO.	LATITUDE	LONGITUDE
1	23° 51' 37.202" N	86° 57' 50.976" E
2	23° 51' 36.966" N	86° 57' 50.995" E
3	23° 51' 34.158" N	86° 57' 51.225" E
4	23° 51' 31.880" N	86° 57' 51.412" E
5	23° 51' 28.583" N	86° 57' 52.085" E
6	23° 51' 27.475" N	86° 57' 52.311" E
7	23° 51' 27.323" N	86° 57' 52.326" E
8	23° 51' 27.316" N	86° 57' 52.327" E
9	23° 51' 21.418" N	86° 57' 52.911" E
10	23° 51' 16.875" N	86° 57' 50.817" E
11	23° 51' 16.387" N	86° 57' 50.109" E
12	23° 51' 21.803" N	86° 57' 50.406" E
13	23° 51' 22.562" N	86° 57' 50.392" E
14	23° 51' 25.025" N	86° 57' 50.345" E
15	23° 51' 28.077" N	86° 57' 50.287" E
16	23° 51' 33.570" N	86° 57' 50.379" E
17	23° 51' 34.551" N	86° 57' 50.537" E
18	23° 51' 34.997" N	86° 57' 50.609" E
19	23° 51' 36.347" N	86° 57' 50.827" E
20	23° 51' 36.430" N	86° 57' 50.840" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

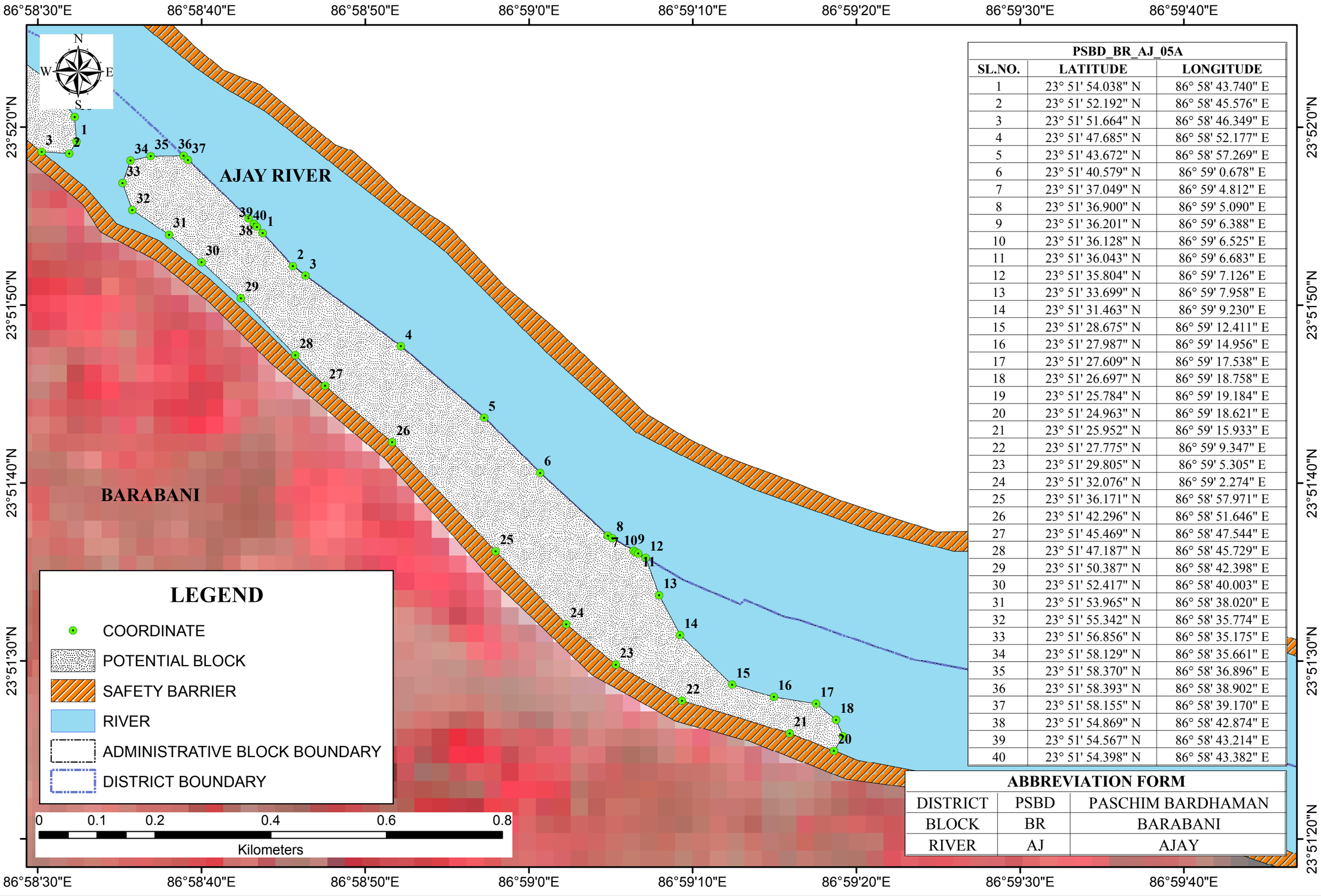
POTENTIAL BLOCK PSBD_BR_AJ_05 OF AJAY RIVER



PSBD_BR_AJ_05		
SL.NO.	LATITUDE	LONGITUDE
1	23° 52' 2.046" N	86° 58' 4.789" E
2	23° 52' 2.912" N	86° 58' 5.826" E
3	23° 52' 2.964" N	86° 58' 5.934" E
4	23° 52' 0.851" N	86° 58' 8.958" E
5	23° 51' 59.946" N	86° 58' 8.105" E
6	23° 51' 59.559" N	86° 58' 7.740" E
7	23° 51' 59.453" N	86° 58' 7.641" E
8	23° 51' 58.362" N	86° 58' 6.612" E
9	23° 51' 56.997" N	86° 58' 5.326" E
10	23° 51' 56.281" N	86° 58' 4.650" E
11	23° 51' 55.998" N	86° 58' 4.384" E
12	23° 51' 52.621" N	86° 58' 0.852" E
13	23° 51' 50.525" N	86° 57' 58.660" E
14	23° 51' 48.445" N	86° 57' 57.459" E
15	23° 51' 47.734" N	86° 57' 57.049" E
16	23° 51' 47.638" N	86° 57' 56.993" E
17	23° 51' 46.281" N	86° 57' 56.210" E
18	23° 51' 45.736" N	86° 57' 55.896" E
19	23° 51' 45.535" N	86° 57' 55.780" E
20	23° 51' 44.393" N	86° 57' 55.323" E
21	23° 51' 45.095" N	86° 57' 53.504" E
22	23° 51' 45.735" N	86° 57' 53.503" E
23	23° 51' 47.707" N	86° 57' 53.503" E
24	23° 51' 47.727" N	86° 57' 53.512" E
25	23° 51' 48.755" N	86° 57' 54.012" E
26	23° 51' 49.063" N	86° 57' 54.162" E
27	23° 51' 49.592" N	86° 57' 54.419" E
28	23° 51' 50.483" N	86° 57' 54.906" E
29	23° 51' 51.738" N	86° 57' 55.592" E
30	23° 51' 53.150" N	86° 57' 56.365" E
31	23° 51' 53.365" N	86° 57' 56.532" E
32	23° 51' 54.657" N	86° 57' 57.792" E
33	23° 51' 54.798" N	86° 57' 58.828" E
34	23° 51' 55.194" N	86° 57' 59.424" E
35	23° 51' 56.828" N	86° 58' 0.601" E
36	23° 51' 57.031" N	86° 58' 0.675" E
37	23° 51' 59.116" N	86° 58' 1.433" E
38	23° 51' 59.157" N	86° 58' 1.910" E
39	23° 51' 59.218" N	86° 58' 2.617" E
40	23° 51' 59.253" N	86° 58' 3.023" E
41	23° 52' 1.841" N	86° 58' 5.477" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

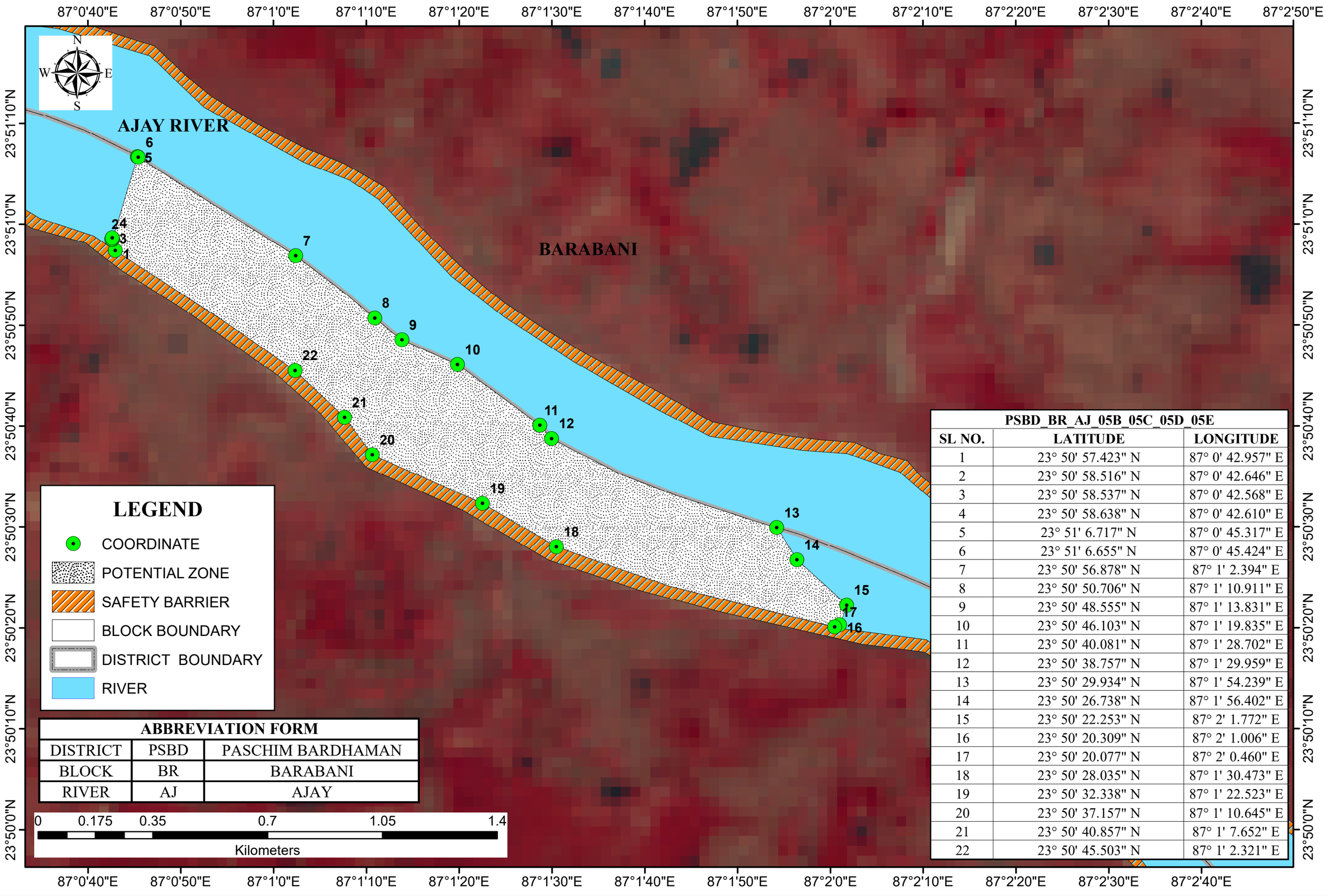
POTENTIAL BLOCK PSBD_BR_AJ_05A OF AJAY RIVER



PSBD_BR_AJ_05A		
SL.NO.	LATITUDE	LONGITUDE
1	23° 51' 54.038" N	86° 58' 43.740" E
2	23° 51' 52.192" N	86° 58' 45.576" E
3	23° 51' 51.664" N	86° 58' 46.349" E
4	23° 51' 47.685" N	86° 58' 52.177" E
5	23° 51' 43.672" N	86° 58' 57.269" E
6	23° 51' 40.579" N	86° 59' 0.678" E
7	23° 51' 37.049" N	86° 59' 4.812" E
8	23° 51' 36.900" N	86° 59' 5.090" E
9	23° 51' 36.201" N	86° 59' 6.388" E
10	23° 51' 36.128" N	86° 59' 6.525" E
11	23° 51' 36.043" N	86° 59' 6.683" E
12	23° 51' 35.804" N	86° 59' 7.126" E
13	23° 51' 33.699" N	86° 59' 7.958" E
14	23° 51' 31.463" N	86° 59' 9.230" E
15	23° 51' 28.675" N	86° 59' 12.411" E
16	23° 51' 27.987" N	86° 59' 14.956" E
17	23° 51' 27.609" N	86° 59' 17.538" E
18	23° 51' 26.697" N	86° 59' 18.758" E
19	23° 51' 25.784" N	86° 59' 19.184" E
20	23° 51' 24.963" N	86° 59' 18.621" E
21	23° 51' 25.952" N	86° 59' 15.933" E
22	23° 51' 27.775" N	86° 59' 9.347" E
23	23° 51' 29.805" N	86° 59' 5.305" E
24	23° 51' 32.076" N	86° 59' 2.274" E
25	23° 51' 36.171" N	86° 58' 57.971" E
26	23° 51' 42.296" N	86° 58' 51.646" E
27	23° 51' 45.469" N	86° 58' 47.544" E
28	23° 51' 47.187" N	86° 58' 45.729" E
29	23° 51' 50.387" N	86° 58' 42.398" E
30	23° 51' 52.417" N	86° 58' 40.003" E
31	23° 51' 53.965" N	86° 58' 38.020" E
32	23° 51' 55.342" N	86° 58' 35.774" E
33	23° 51' 56.856" N	86° 58' 35.175" E
34	23° 51' 58.129" N	86° 58' 35.661" E
35	23° 51' 58.370" N	86° 58' 36.896" E
36	23° 51' 58.393" N	86° 58' 38.902" E
37	23° 51' 58.155" N	86° 58' 39.170" E
38	23° 51' 54.869" N	86° 58' 42.874" E
39	23° 51' 54.567" N	86° 58' 43.214" E
40	23° 51' 54.398" N	86° 58' 43.382" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

POTENTIAL BLOCK PSBD_BR_AJ_05B_05C_05D_05E OF AJAY RIVER



LEGEND

- COORDINATE
- POTENTIAL ZONE
- SAFETY BARRIER
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- RIVER

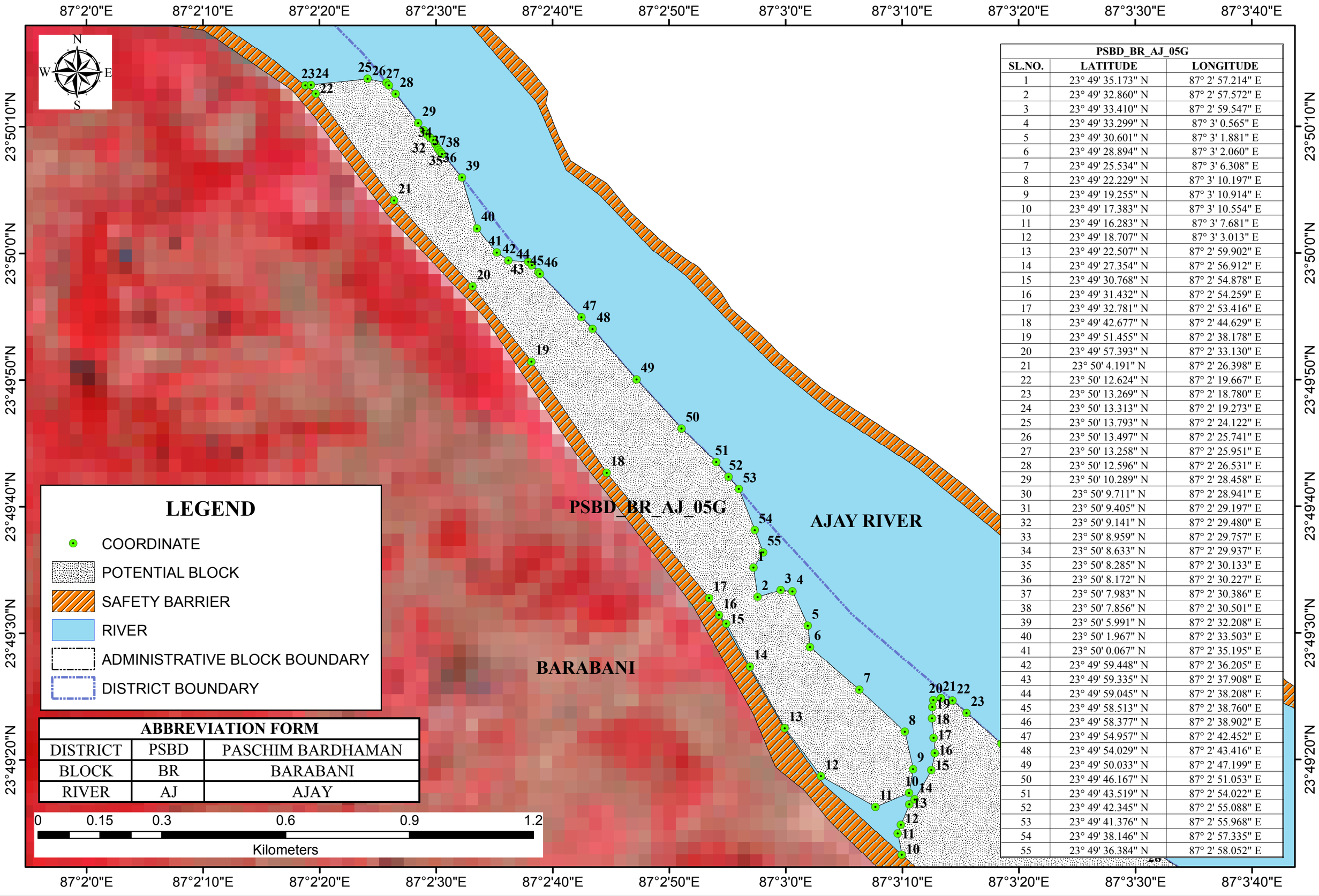
ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

0 0.175 0.35 0.7 1.05 1.4

Kilometers

PSBD_BR_AJ_05B_05C_05D_05E		
SL NO.	LATITUDE	LONGITUDE
1	23° 50' 57.423" N	87° 0' 42.957" E
2	23° 50' 58.516" N	87° 0' 42.646" E
3	23° 50' 58.537" N	87° 0' 42.568" E
4	23° 50' 58.638" N	87° 0' 42.610" E
5	23° 51' 6.717" N	87° 0' 45.317" E
6	23° 51' 6.655" N	87° 0' 45.424" E
7	23° 50' 56.878" N	87° 1' 2.394" E
8	23° 50' 50.706" N	87° 1' 10.911" E
9	23° 50' 48.555" N	87° 1' 13.831" E
10	23° 50' 46.103" N	87° 1' 19.835" E
11	23° 50' 40.081" N	87° 1' 28.702" E
12	23° 50' 38.757" N	87° 1' 29.959" E
13	23° 50' 29.934" N	87° 1' 54.239" E
14	23° 50' 26.738" N	87° 1' 56.402" E
15	23° 50' 22.253" N	87° 2' 1.772" E
16	23° 50' 20.309" N	87° 2' 1.006" E
17	23° 50' 20.077" N	87° 2' 0.460" E
18	23° 50' 28.035" N	87° 1' 30.473" E
19	23° 50' 32.338" N	87° 1' 22.523" E
20	23° 50' 37.157" N	87° 1' 10.645" E
21	23° 50' 40.857" N	87° 1' 7.652" E
22	23° 50' 45.503" N	87° 1' 2.321" E

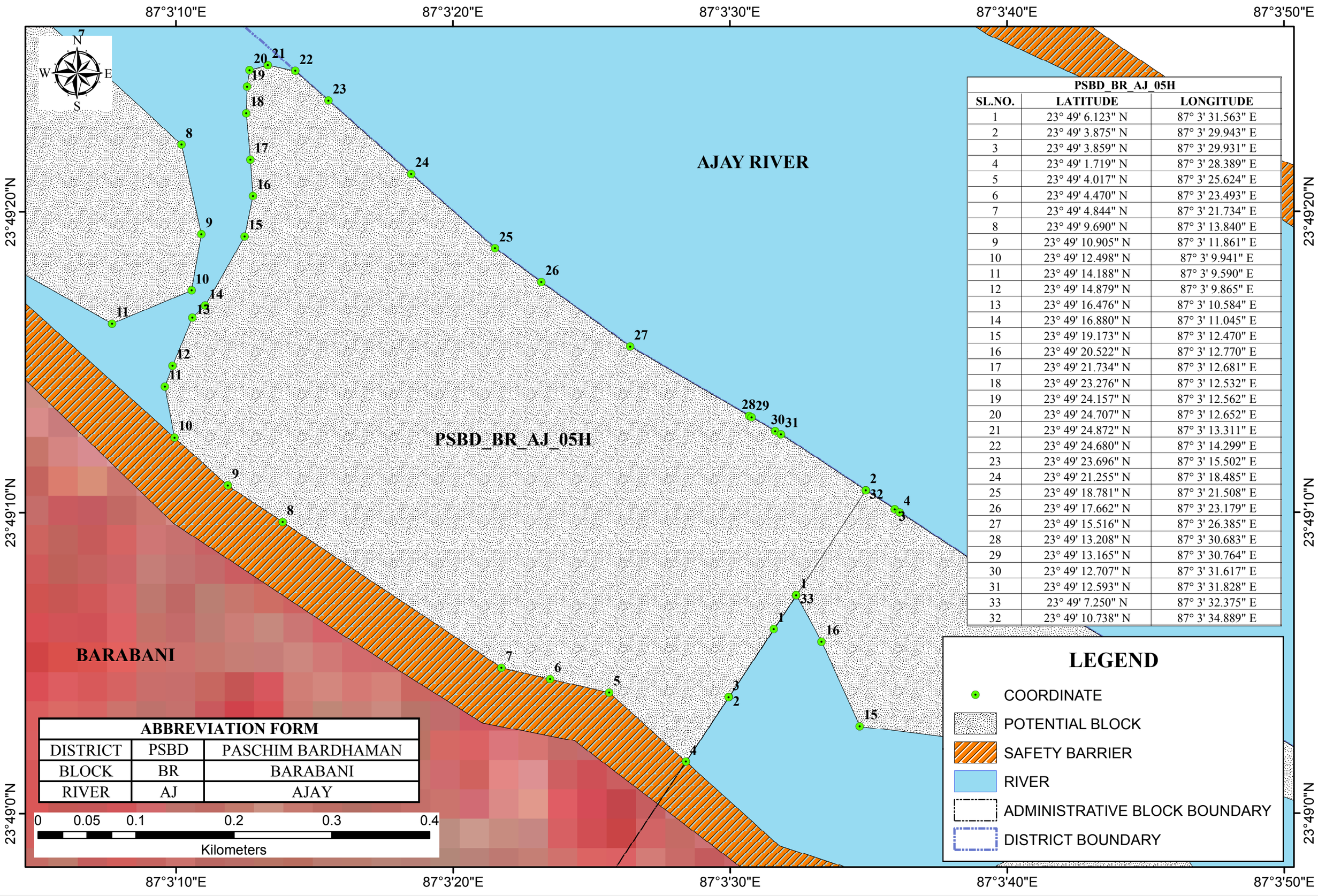
POTENTIAL BLOCK PSBD_BR_AJ_05G OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

PSBD_BR_AJ_05G		
SL.NO.	LATITUDE	LONGITUDE
1	23° 49' 35.173" N	87° 2' 57.214" E
2	23° 49' 32.860" N	87° 2' 57.572" E
3	23° 49' 33.410" N	87° 2' 59.547" E
4	23° 49' 33.299" N	87° 3' 0.565" E
5	23° 49' 30.601" N	87° 3' 1.881" E
6	23° 49' 28.894" N	87° 3' 2.060" E
7	23° 49' 25.534" N	87° 3' 6.308" E
8	23° 49' 22.229" N	87° 3' 10.197" E
9	23° 49' 19.255" N	87° 3' 10.914" E
10	23° 49' 17.383" N	87° 3' 10.554" E
11	23° 49' 16.283" N	87° 3' 7.681" E
12	23° 49' 18.707" N	87° 3' 3.013" E
13	23° 49' 22.507" N	87° 2' 59.902" E
14	23° 49' 27.354" N	87° 2' 56.912" E
15	23° 49' 30.768" N	87° 2' 54.878" E
16	23° 49' 31.432" N	87° 2' 54.259" E
17	23° 49' 32.781" N	87° 2' 53.416" E
18	23° 49' 42.677" N	87° 2' 44.629" E
19	23° 49' 51.455" N	87° 2' 38.178" E
20	23° 49' 57.393" N	87° 2' 33.130" E
21	23° 50' 4.191" N	87° 2' 26.398" E
22	23° 50' 12.624" N	87° 2' 19.667" E
23	23° 50' 13.269" N	87° 2' 18.780" E
24	23° 50' 13.313" N	87° 2' 19.273" E
25	23° 50' 13.793" N	87° 2' 24.122" E
26	23° 50' 13.497" N	87° 2' 25.741" E
27	23° 50' 13.258" N	87° 2' 25.951" E
28	23° 50' 12.596" N	87° 2' 26.531" E
29	23° 50' 10.289" N	87° 2' 28.458" E
30	23° 50' 9.711" N	87° 2' 28.941" E
31	23° 50' 9.405" N	87° 2' 29.197" E
32	23° 50' 9.141" N	87° 2' 29.480" E
33	23° 50' 8.959" N	87° 2' 29.757" E
34	23° 50' 8.633" N	87° 2' 29.937" E
35	23° 50' 8.285" N	87° 2' 30.133" E
36	23° 50' 8.172" N	87° 2' 30.227" E
37	23° 50' 7.983" N	87° 2' 30.386" E
38	23° 50' 7.856" N	87° 2' 30.501" E
39	23° 50' 5.991" N	87° 2' 32.208" E
40	23° 50' 1.967" N	87° 2' 33.503" E
41	23° 50' 0.067" N	87° 2' 35.195" E
42	23° 49' 59.448" N	87° 2' 36.205" E
43	23° 49' 59.335" N	87° 2' 37.908" E
44	23° 49' 59.045" N	87° 2' 38.208" E
45	23° 49' 58.513" N	87° 2' 38.760" E
46	23° 49' 58.377" N	87° 2' 38.902" E
47	23° 49' 54.957" N	87° 2' 42.452" E
48	23° 49' 54.029" N	87° 2' 43.416" E
49	23° 49' 50.033" N	87° 2' 47.199" E
50	23° 49' 46.167" N	87° 2' 51.053" E
51	23° 49' 43.519" N	87° 2' 54.022" E
52	23° 49' 42.345" N	87° 2' 55.088" E
53	23° 49' 41.376" N	87° 2' 55.968" E
54	23° 49' 38.146" N	87° 2' 57.335" E
55	23° 49' 36.384" N	87° 2' 58.052" E

POTENTIAL BLOCK PSBD_BR_AJ_05H OF AJAY RIVER



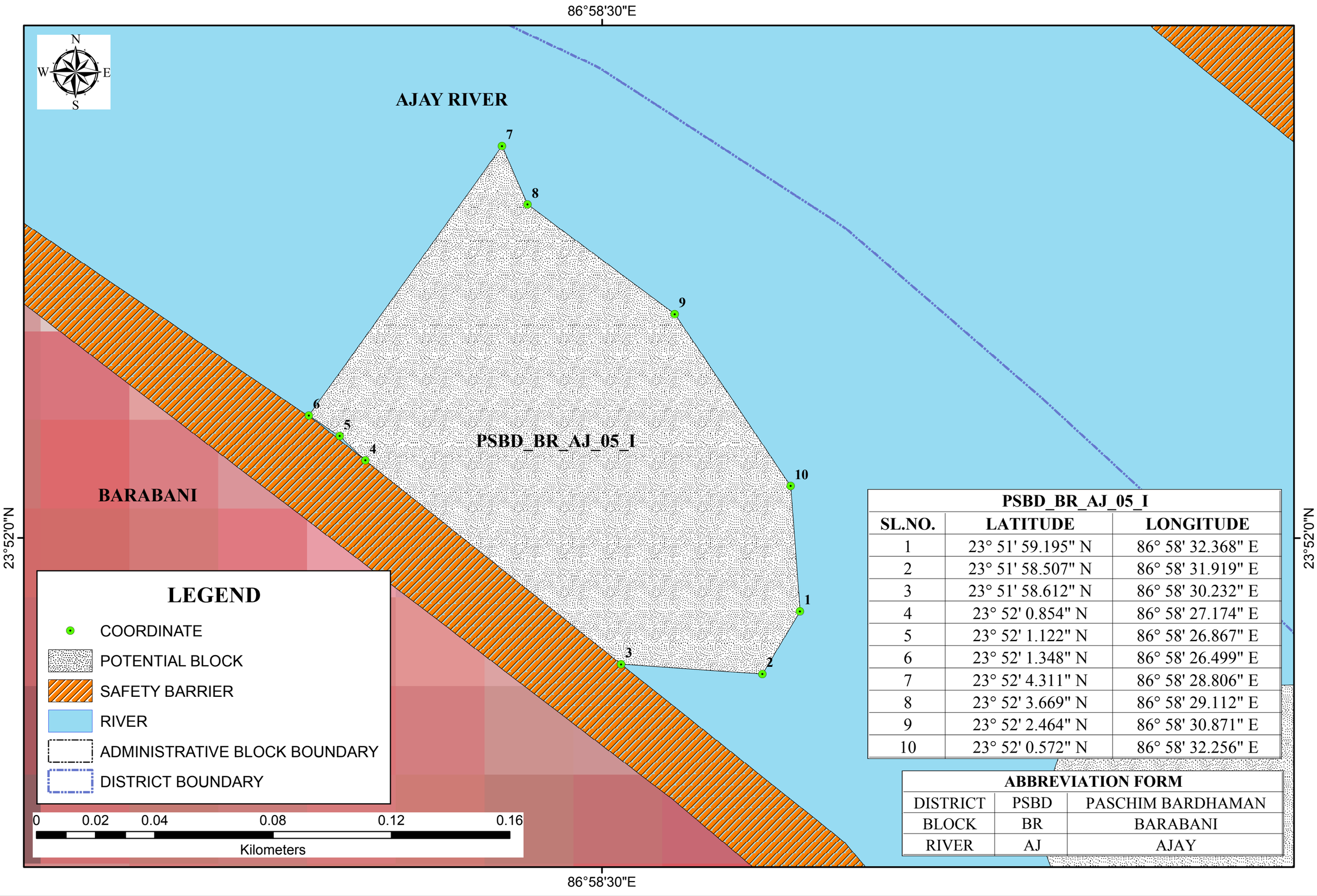
PSBD_BR_AJ_05H		
SL.NO.	LATITUDE	LONGITUDE
1	23° 49' 6.123" N	87° 3' 31.563" E
2	23° 49' 3.875" N	87° 3' 29.943" E
3	23° 49' 3.859" N	87° 3' 29.931" E
4	23° 49' 1.719" N	87° 3' 28.389" E
5	23° 49' 4.017" N	87° 3' 25.624" E
6	23° 49' 4.470" N	87° 3' 23.493" E
7	23° 49' 4.844" N	87° 3' 21.734" E
8	23° 49' 9.690" N	87° 3' 13.840" E
9	23° 49' 10.905" N	87° 3' 11.861" E
10	23° 49' 12.498" N	87° 3' 9.941" E
11	23° 49' 14.188" N	87° 3' 9.590" E
12	23° 49' 14.879" N	87° 3' 9.865" E
13	23° 49' 16.476" N	87° 3' 10.584" E
14	23° 49' 16.880" N	87° 3' 11.045" E
15	23° 49' 19.173" N	87° 3' 12.470" E
16	23° 49' 20.522" N	87° 3' 12.770" E
17	23° 49' 21.734" N	87° 3' 12.681" E
18	23° 49' 23.276" N	87° 3' 12.532" E
19	23° 49' 24.157" N	87° 3' 12.562" E
20	23° 49' 24.707" N	87° 3' 12.652" E
21	23° 49' 24.872" N	87° 3' 13.311" E
22	23° 49' 24.680" N	87° 3' 14.299" E
23	23° 49' 23.696" N	87° 3' 15.502" E
24	23° 49' 21.255" N	87° 3' 18.485" E
25	23° 49' 18.781" N	87° 3' 21.508" E
26	23° 49' 17.662" N	87° 3' 23.179" E
27	23° 49' 15.516" N	87° 3' 26.385" E
28	23° 49' 13.208" N	87° 3' 30.683" E
29	23° 49' 13.165" N	87° 3' 30.764" E
30	23° 49' 12.707" N	87° 3' 31.617" E
31	23° 49' 12.593" N	87° 3' 31.828" E
33	23° 49' 7.250" N	87° 3' 32.375" E
32	23° 49' 10.738" N	87° 3' 34.889" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

POTENTIAL BLOCK PSBD_BR_AJ_05_I OF AJAY RIVER



PSBD_BR_AJ_05_I		
SL.NO.	LATITUDE	LONGITUDE
1	23° 51' 59.195" N	86° 58' 32.368" E
2	23° 51' 58.507" N	86° 58' 31.919" E
3	23° 51' 58.612" N	86° 58' 30.232" E
4	23° 52' 0.854" N	86° 58' 27.174" E
5	23° 52' 1.122" N	86° 58' 26.867" E
6	23° 52' 1.348" N	86° 58' 26.499" E
7	23° 52' 4.311" N	86° 58' 28.806" E
8	23° 52' 3.669" N	86° 58' 29.112" E
9	23° 52' 2.464" N	86° 58' 30.871" E
10	23° 52' 0.572" N	86° 58' 32.256" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	BR	BARABANI
RIVER	AJ	AJAY

POTENTIAL BLOCK PSBD_JM_AJ_05I_1 OF AJAY RIVER

87°3'30"E 87°3'40"E 87°3'50"E

23°49'10"N

23°49'0"N

AJAY RIVER

PSBD_JM_AJ_05I_1

JAMURIA

PSBD_JM_AJ_05I_1		
SL.NO.	LATITUDE	LONGITUDE
1	23° 49' 7.250" N	87° 3' 32.375" E
2	23° 49' 10.738" N	87° 3' 34.889" E
3	23° 49' 10.105" N	87° 3' 35.933" E
4	23° 49' 10.000" N	87° 3' 36.106" E
5	23° 49' 8.030" N	87° 3' 39.356" E
6	23° 49' 1.859" N	87° 3' 50.965" E
7	23° 49' 0.228" N	87° 3' 54.706" E
8	23° 49' 0.098" N	87° 3' 55.175" E
9	23° 48' 59.747" N	87° 3' 53.459" E
10	23° 49' 0.078" N	87° 3' 51.305" E
11	23° 49' 1.015" N	87° 3' 48.612" E
12	23° 49' 2.173" N	87° 3' 45.501" E
13	23° 49' 2.780" N	87° 3' 42.030" E
14	23° 49' 2.396" N	87° 3' 39.097" E
15	23° 49' 2.893" N	87° 3' 34.668" E
16	23° 49' 5.702" N	87° 3' 33.293" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

0 0.04 0.08 0.16 0.24 0.32

Kilometers

POTENTIAL BLOCK PSBD_JM_AJ_05I_2 OF AJAY RIVER

87°3'40"E 87°3'50"E

23°49'0"N

AJAY RIVER

PSBD_JM_AJ_05I_2

JAMURIA

PSBD_JM_AJ_05I_2		
SL.NO.	LATITUDE	LONGITUDE
1	23° 48' 56.226" N	87° 3' 46.276" E
2	23° 48' 56.160" N	87° 3' 45.536" E
3	23° 48' 56.600" N	87° 3' 44.439" E
4	23° 48' 57.043" N	87° 3' 39.434" E
5	23° 48' 57.716" N	87° 3' 38.616" E
6	23° 48' 59.146" N	87° 3' 41.250" E
7	23° 48' 59.311" N	87° 3' 43.225" E
8	23° 48' 59.089" N	87° 3' 46.098" E
9	23° 48' 57.272" N	87° 3' 47.294" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

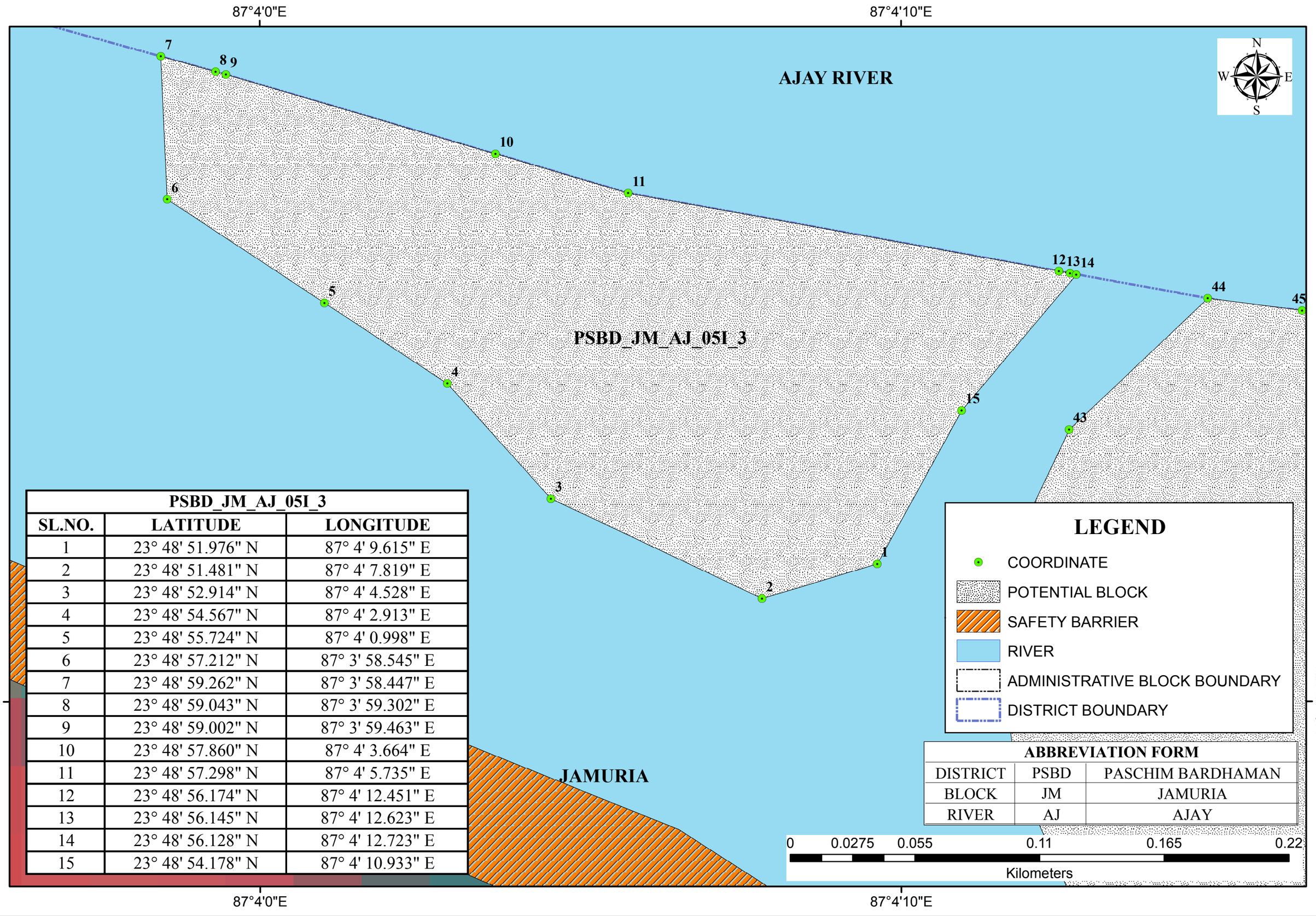
0 0.0275 0.055 0.11 0.165 0.22

Kilometers

23°48'50"N

87°3'40"E 87°3'50"E

POTENTIAL BLOCK PSBD_JM_AJ_05I_3 OF AJAY RIVER



PSBD_JM_AJ_05I_3		
SL.NO.	LATITUDE	LONGITUDE
1	23° 48' 51.976" N	87° 4' 9.615" E
2	23° 48' 51.481" N	87° 4' 7.819" E
3	23° 48' 52.914" N	87° 4' 4.528" E
4	23° 48' 54.567" N	87° 4' 2.913" E
5	23° 48' 55.724" N	87° 4' 0.998" E
6	23° 48' 57.212" N	87° 3' 58.545" E
7	23° 48' 59.262" N	87° 3' 58.447" E
8	23° 48' 59.043" N	87° 3' 59.302" E
9	23° 48' 59.002" N	87° 3' 59.463" E
10	23° 48' 57.860" N	87° 4' 3.664" E
11	23° 48' 57.298" N	87° 4' 5.735" E
12	23° 48' 56.174" N	87° 4' 12.451" E
13	23° 48' 56.145" N	87° 4' 12.623" E
14	23° 48' 56.128" N	87° 4' 12.723" E
15	23° 48' 54.178" N	87° 4' 10.933" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

POTENTIAL BLOCK PSBD_JM_AJ_06 OF AJAY RIVER

87°4'10"E 87°4'20"E 87°4'30"E 87°4'40"E 87°4'50"E 87°5'0"E 87°5'10"E

23°48'50"N 23°48'40"N 23°48'30"N 23°48'20"N

AJAY RIVER

PSBD_JM_AJ_06

JAMURIA

PSBD_JM_AJ_06		
SL.NO.	LATITUDE	LONGITUDE
1	23° 48' 46.463" N	87° 4' 24.873" E
2	23° 48' 43.873" N	87° 4' 28.582" E
3	23° 48' 41.944" N	87° 4' 33.130" E
4	23° 48' 39.520" N	87° 4' 35.881" E
5	23° 48' 38.308" N	87° 4' 36.599" E
6	23° 48' 38.033" N	87° 4' 35.521" E
7	23° 48' 39.002" N	87° 4' 33.052" E
8	23° 48' 41.395" N	87° 4' 29.957" E
9	23° 48' 42.167" N	87° 4' 27.325" E
10	23° 48' 42.134" N	87° 4' 24.690" E
11	23° 48' 35.562" N	87° 4' 32.500" E
12	23° 48' 35.370" N	87° 4' 33.635" E
13	23° 48' 34.302" N	87° 4' 35.803" E
14	23° 48' 32.711" N	87° 4' 35.965" E
15	23° 48' 27.961" N	87° 4' 45.737" E
16	23° 48' 27.962" N	87° 4' 45.737" E
17	23° 48' 28.275" N	87° 4' 45.899" E
18	23° 48' 28.536" N	87° 4' 46.752" E
19	23° 48' 28.686" N	87° 4' 49.303" E
20	23° 48' 28.479" N	87° 4' 50.949" E
21	23° 48' 27.136" N	87° 4' 51.771" E
22	23° 48' 26.481" N	87° 4' 53.416" E
23	23° 48' 26.240" N	87° 4' 54.725" E
24	23° 48' 25.826" N	87° 4' 56.969" E
25	23° 48' 25.034" N	87° 4' 57.866" E
26	23° 48' 23.416" N	87° 4' 57.977" E
27	23° 48' 22.004" N	87° 4' 57.995" E
28	23° 48' 21.254" N	87° 4' 59.538" E
29	23° 48' 19.602" N	87° 5' 2.937" E
30	23° 48' 19.930" N	87° 5' 0.489" E
31	23° 48' 19.504" N	87° 4' 53.288" E
32	23° 48' 23.293" N	87° 4' 46.652" E
33	23° 48' 25.963" N	87° 4' 42.165" E
34	23° 48' 26.653" N	87° 4' 36.929" E
35	23° 48' 29.582" N	87° 4' 30.852" E
36	23° 48' 34.746" N	87° 4' 25.525" E
37	23° 48' 43.041" N	87° 4' 15.195" E
38	23° 48' 46.031" N	87° 4' 10.134" E
39	23° 48' 45.994" N	87° 4' 10.403" E
40	23° 48' 46.634" N	87° 4' 12.904" E
41	23° 48' 49.002" N	87° 4' 11.768" E
42	23° 48' 51.590" N	87° 4' 11.410" E
43	23° 48' 53.902" N	87° 4' 12.608" E
44	23° 48' 55.785" N	87° 4' 14.772" E
45	23° 48' 55.609" N	87° 4' 16.243" E
46	23° 48' 55.417" N	87° 4' 18.349" E
47	23° 48' 54.521" N	87° 4' 21.177" E
48	23° 48' 54.397" N	87° 4' 21.569" E
49	23° 48' 52.907" N	87° 4' 21.645" E
50	23° 48' 49.713" N	87° 4' 21.883" E
51	23° 48' 48.721" N	87° 4' 22.959" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

0 0.075 0.15 0.3 0.45 0.6

Kilometers

POTENTIAL BLOCK PSBD_JM_AJ_06_1 OF AJAY RIVER

PSBD_JM_AJ_06_1					
SL.NO.	LATITUDE	LONGITUDE	SL.NO.	LATITUDE	LONGITUDE
1	23° 48' 11.567" N	87° 5' 39.478" E	33	23° 48' 48.970" N	87° 4' 31.477" E
2	23° 48' 11.295" N	87° 5' 34.572" E	34	23° 48' 47.183" N	87° 4' 33.880" E
3	23° 48' 12.068" N	87° 5' 31.221" E	35	23° 48' 45.025" N	87° 4' 37.003" E
4	23° 48' 13.612" N	87° 5' 28.110" E	36	23° 48' 44.730" N	87° 4' 37.431" E
5	23° 48' 15.761" N	87° 5' 25.419" E	37	23° 48' 43.252" N	87° 4' 39.729" E
6	23° 48' 15.929" N	87° 5' 19.973" E	38	23° 48' 41.790" N	87° 4' 42.255" E
7	23° 48' 16.427" N	87° 5' 16.203" E	39	23° 48' 40.297" N	87° 4' 45.481" E
8	23° 48' 17.144" N	87° 5' 13.331" E	40	23° 48' 39.305" N	87° 4' 47.626" E
9	23° 48' 18.137" N	87° 5' 11.177" E	41	23° 48' 37.713" N	87° 4' 50.700" E
10	23° 48' 20.121" N	87° 5' 8.066" E	42	23° 48' 36.430" N	87° 4' 52.962" E
11	23° 48' 23.591" N	87° 5' 5.615" E	43	23° 48' 35.391" N	87° 4' 56.972" E
12	23° 48' 26.345" N	87° 5' 3.822" E	44	23° 48' 34.303" N	87° 5' 2.413" E
13	23° 48' 29.816" N	87° 4' 59.335" E	45	23° 48' 33.264" N	87° 5' 7.183" E
14	23° 48' 32.626" N	87° 4' 56.764" E	46	23° 48' 33.191" N	87° 5' 7.622" E
15	23° 48' 34.390" N	87° 4' 52.935" E	47	23° 48' 32.680" N	87° 5' 10.662" E
16	23° 48' 35.879" N	87° 4' 48.986" E	48	23° 48' 32.291" N	87° 5' 12.146" E
17	23° 48' 37.698" N	87° 4' 45.336" E	49	23° 48' 31.267" N	87° 5' 13.883" E
18	23° 48' 38.855" N	87° 4' 43.182" E	50	23° 48' 30.812" N	87° 5' 14.655" E
19	23° 48' 41.003" N	87° 4' 41.628" E	51	23° 48' 30.214" N	87° 5' 15.580" E
20	23° 48' 43.043" N	87° 4' 36.661" E	52	23° 48' 28.905" N	87° 5' 17.600" E
21	23° 48' 44.036" N	87° 4' 33.251" E	53	23° 48' 28.684" N	87° 5' 17.941" E
22	23° 48' 45.909" N	87° 4' 30.977" E	54	23° 48' 28.250" N	87° 5' 18.644" E
23	23° 48' 47.177" N	87° 4' 27.327" E	55	23° 48' 26.146" N	87° 5' 22.048" E
24	23° 48' 47.839" N	87° 4' 26.131" E	56	23° 48' 25.987" N	87° 5' 22.305" E
25	23° 48' 49.436" N	87° 4' 24.755" E	57	23° 48' 22.996" N	87° 5' 26.468" E
26	23° 48' 51.254" N	87° 4' 23.679" E	58	23° 48' 22.267" N	87° 5' 27.482" E
27	23° 48' 52.741" N	87° 4' 23.381" E	59	23° 48' 20.901" N	87° 5' 29.036" E
28	23° 48' 53.665" N	87° 4' 23.876" E	60	23° 48' 18.059" N	87° 5' 32.270" E
29	23° 48' 53.502" N	87° 4' 24.391" E	61	23° 48' 17.868" N	87° 5' 32.482" E
30	23° 48' 52.576" N	87° 4' 26.460" E	62	23° 48' 15.890" N	87° 5' 34.678" E
31	23° 48' 51.666" N	87° 4' 28.490" E	63	23° 48' 12.318" N	87° 5' 38.644" E
32	23° 48' 50.162" N	87° 4' 30.156" E	64	23° 48' 12.239" N	87° 5' 38.732" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

AJAY RIVER

PSBD_JM_AJ_06_1

JAMURIA

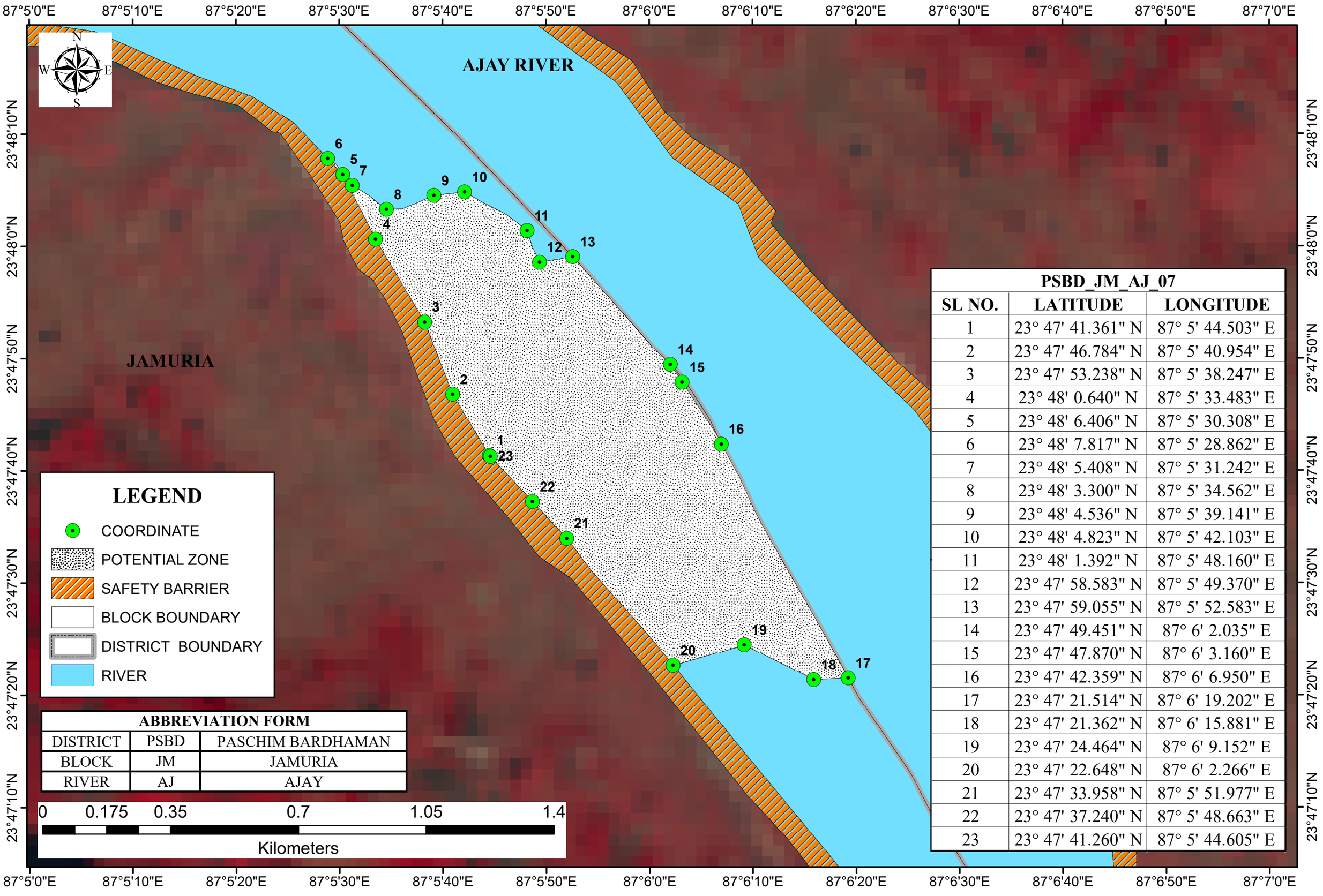
0 0.1 0.2 0.4 0.6 0.8

Kilometers

87°4'30"E 87°4'40"E 87°4'50"E 87°5'0"E 87°5'10"E 87°5'20"E 87°5'30"E 87°5'40"E

23°49'0"N 23°48'50"N 23°48'40"N 23°48'30"N 23°48'20"N

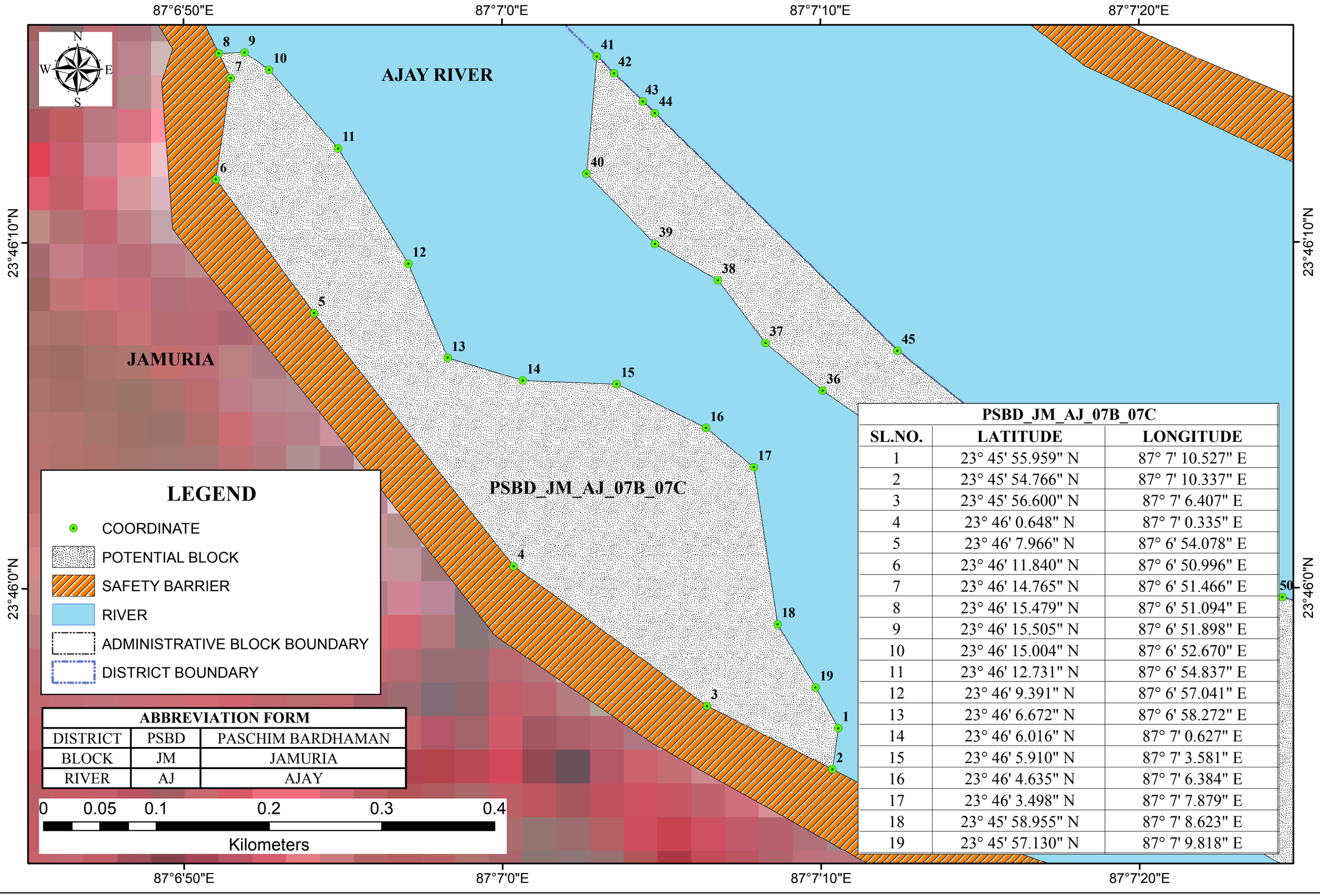
POTENTIAL BLOCK PSBD_JM_AJ_07 OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

PSBD_JM_AJ_07		
SL NO.	LATITUDE	LONGITUDE
1	23° 47' 41.361" N	87° 5' 44.503" E
2	23° 47' 46.784" N	87° 5' 40.954" E
3	23° 47' 53.238" N	87° 5' 38.247" E
4	23° 48' 0.640" N	87° 5' 33.483" E
5	23° 48' 6.406" N	87° 5' 30.308" E
6	23° 48' 7.817" N	87° 5' 28.862" E
7	23° 48' 5.408" N	87° 5' 31.242" E
8	23° 48' 3.300" N	87° 5' 34.562" E
9	23° 48' 4.536" N	87° 5' 39.141" E
10	23° 48' 4.823" N	87° 5' 42.103" E
11	23° 48' 1.392" N	87° 5' 48.160" E
12	23° 47' 58.583" N	87° 5' 49.370" E
13	23° 47' 59.055" N	87° 5' 52.583" E
14	23° 47' 49.451" N	87° 6' 2.035" E
15	23° 47' 47.870" N	87° 6' 3.160" E
16	23° 47' 42.359" N	87° 6' 6.950" E
17	23° 47' 21.514" N	87° 6' 19.202" E
18	23° 47' 21.362" N	87° 6' 15.881" E
19	23° 47' 24.464" N	87° 6' 9.152" E
20	23° 47' 22.648" N	87° 6' 2.266" E
21	23° 47' 33.958" N	87° 5' 51.977" E
22	23° 47' 37.240" N	87° 5' 48.663" E
23	23° 47' 41.260" N	87° 5' 44.605" E

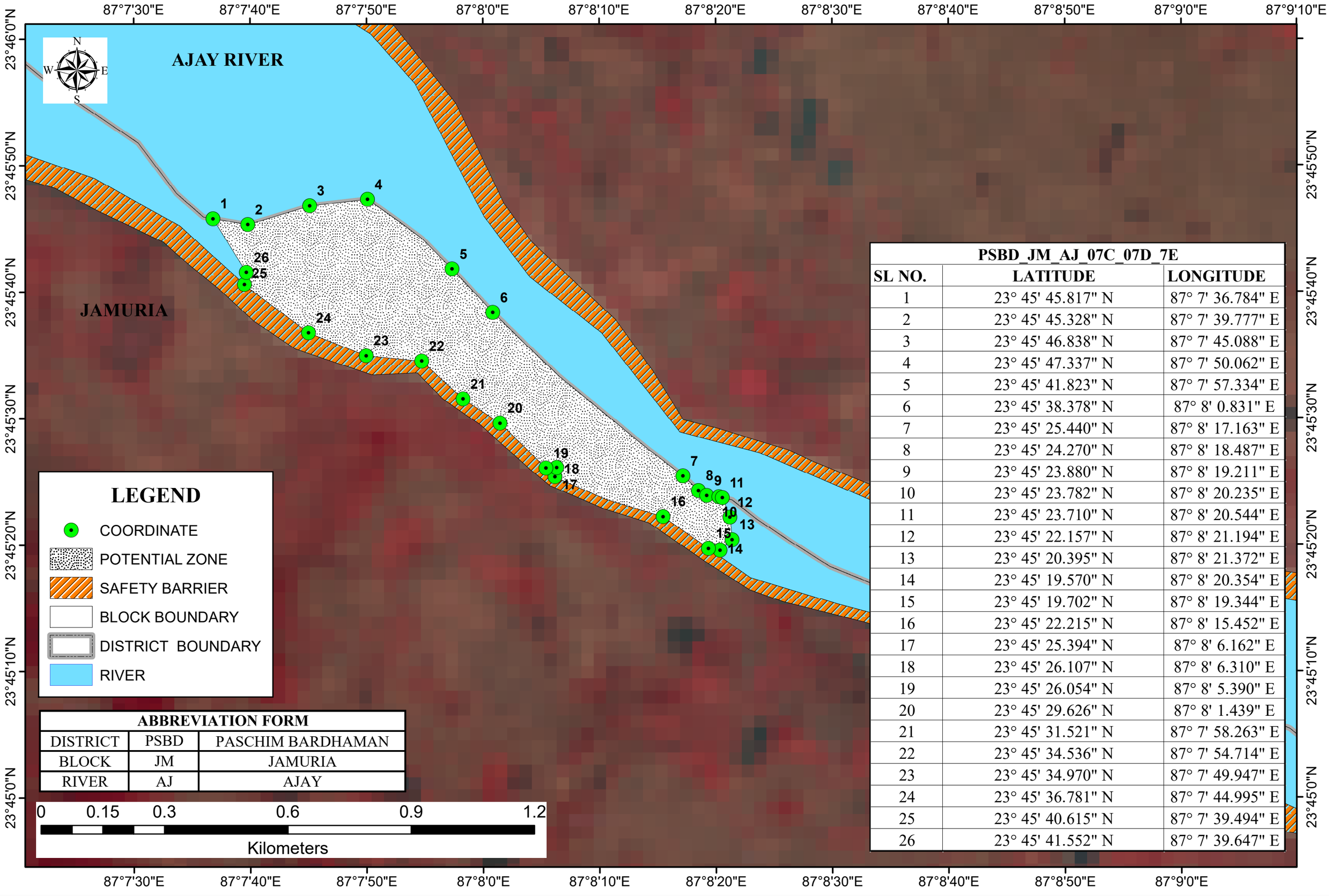
POTENTIAL BLOCK PSBD_JM_AJ_07B_07C OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

PSBD_JM_AJ_07B_07C		
SL.NO.	LATITUDE	LONGITUDE
1	23° 45' 55.959" N	87° 7' 10.527" E
2	23° 45' 54.766" N	87° 7' 10.337" E
3	23° 45' 56.600" N	87° 7' 6.407" E
4	23° 46' 0.648" N	87° 7' 0.335" E
5	23° 46' 7.966" N	87° 6' 54.078" E
6	23° 46' 11.840" N	87° 6' 50.996" E
7	23° 46' 14.765" N	87° 6' 51.466" E
8	23° 46' 15.479" N	87° 6' 51.094" E
9	23° 46' 15.505" N	87° 6' 51.898" E
10	23° 46' 15.004" N	87° 6' 52.670" E
11	23° 46' 12.731" N	87° 6' 54.837" E
12	23° 46' 9.391" N	87° 6' 57.041" E
13	23° 46' 6.672" N	87° 6' 58.272" E
14	23° 46' 6.016" N	87° 7' 0.627" E
15	23° 46' 5.910" N	87° 7' 3.581" E
16	23° 46' 4.635" N	87° 7' 6.384" E
17	23° 46' 3.498" N	87° 7' 7.879" E
18	23° 45' 58.955" N	87° 7' 8.623" E
19	23° 45' 57.130" N	87° 7' 9.818" E

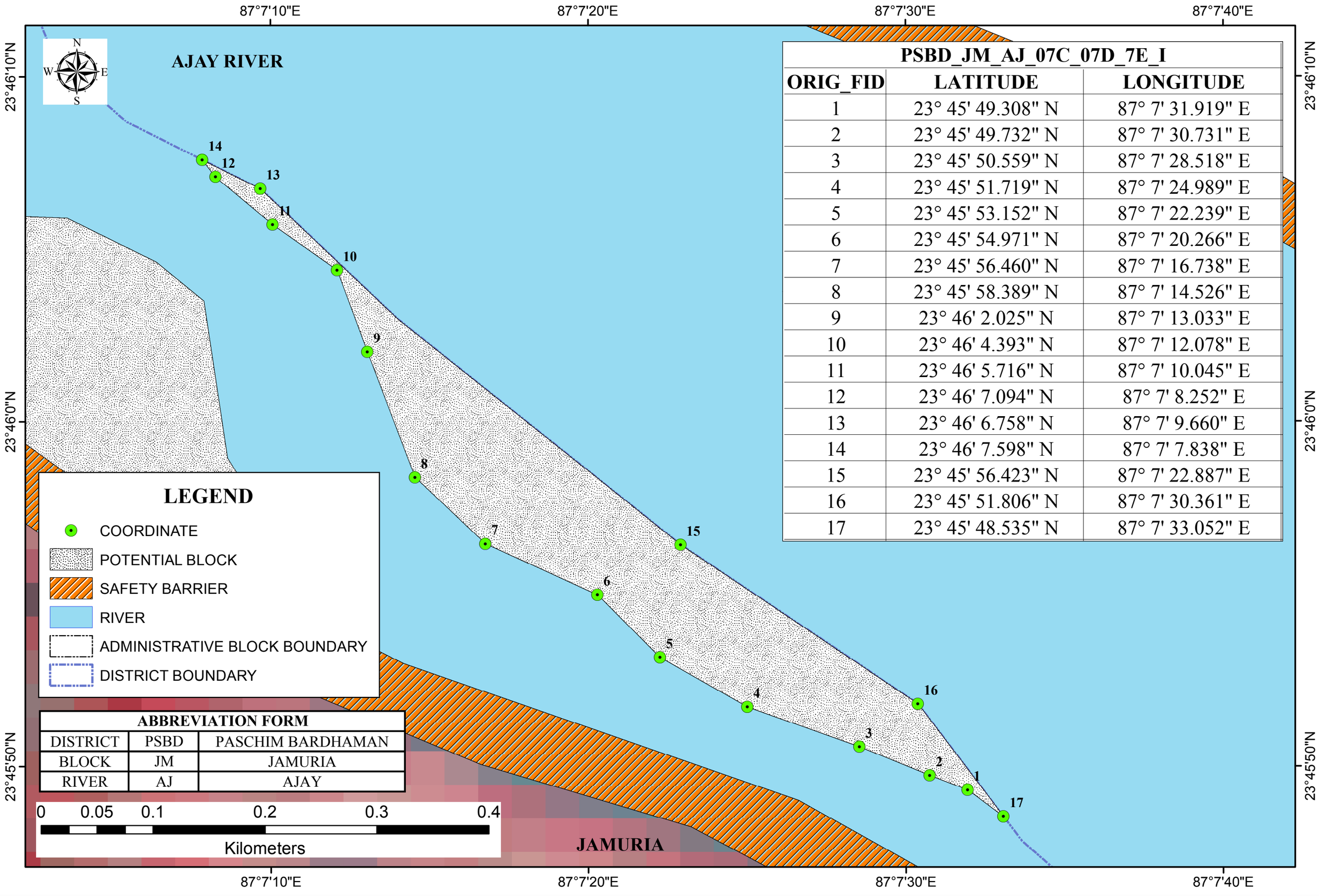
POTENTIAL BLOCK PSBD_JM_AJ_07C_07D_7E OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

PSBD_JM_AJ_07C_07D_7E		
SL NO.	LATITUDE	LONGITUDE
1	23° 45' 45.817" N	87° 7' 36.784" E
2	23° 45' 45.328" N	87° 7' 39.777" E
3	23° 45' 46.838" N	87° 7' 45.088" E
4	23° 45' 47.337" N	87° 7' 50.062" E
5	23° 45' 41.823" N	87° 7' 57.334" E
6	23° 45' 38.378" N	87° 8' 0.831" E
7	23° 45' 25.440" N	87° 8' 17.163" E
8	23° 45' 24.270" N	87° 8' 18.487" E
9	23° 45' 23.880" N	87° 8' 19.211" E
10	23° 45' 23.782" N	87° 8' 20.235" E
11	23° 45' 23.710" N	87° 8' 20.544" E
12	23° 45' 22.157" N	87° 8' 21.194" E
13	23° 45' 20.395" N	87° 8' 21.372" E
14	23° 45' 19.570" N	87° 8' 20.354" E
15	23° 45' 19.702" N	87° 8' 19.344" E
16	23° 45' 22.215" N	87° 8' 15.452" E
17	23° 45' 25.394" N	87° 8' 6.162" E
18	23° 45' 26.107" N	87° 8' 6.310" E
19	23° 45' 26.054" N	87° 8' 5.390" E
20	23° 45' 29.626" N	87° 8' 1.439" E
21	23° 45' 31.521" N	87° 7' 58.263" E
22	23° 45' 34.536" N	87° 7' 54.714" E
23	23° 45' 34.970" N	87° 7' 49.947" E
24	23° 45' 36.781" N	87° 7' 44.995" E
25	23° 45' 40.615" N	87° 7' 39.494" E
26	23° 45' 41.552" N	87° 7' 39.647" E

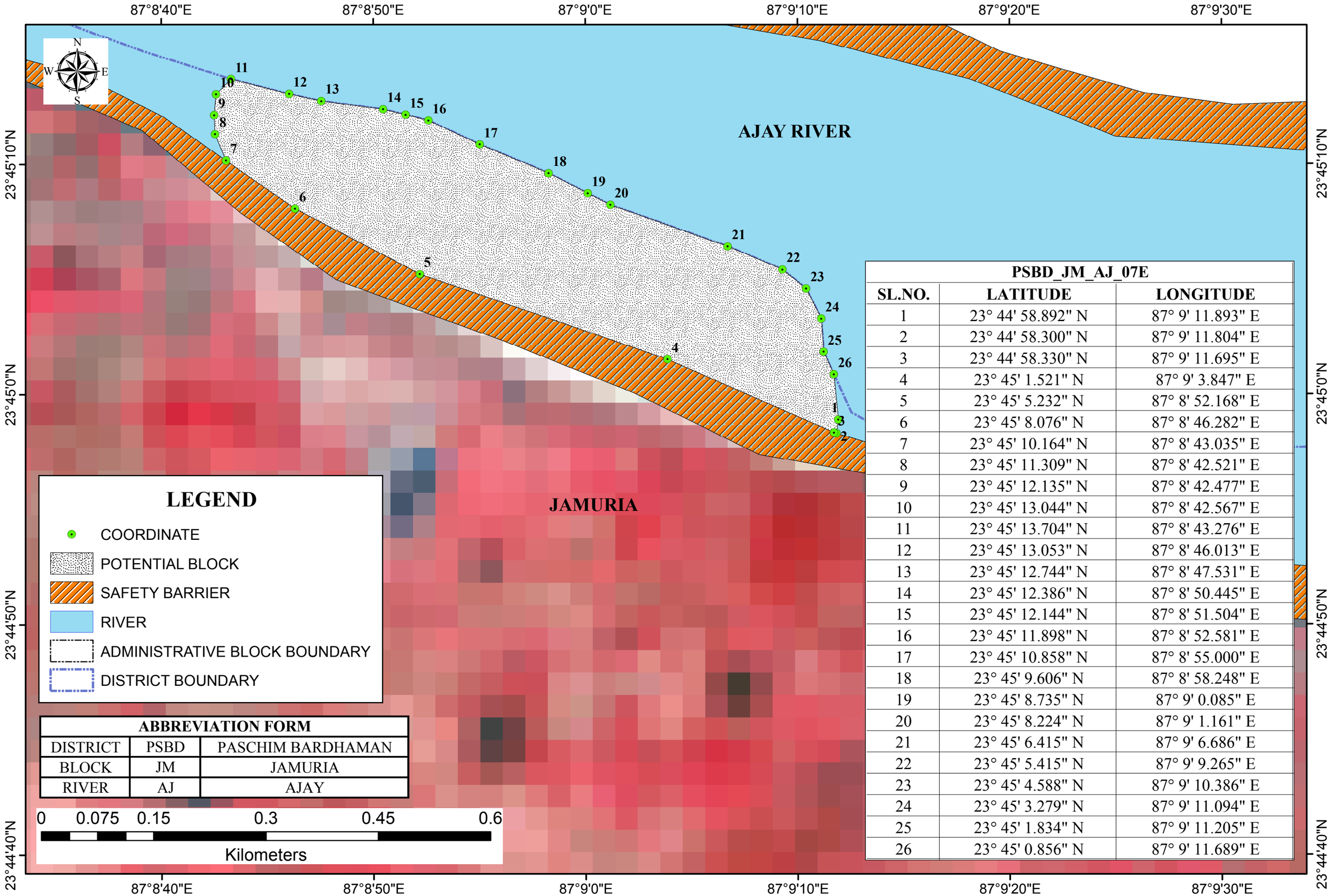
POTENTIAL BLOCK PSBD_JM_AJ_07C_07D_7E_I OF AJAY RIVER



PSBD_JM_AJ_07C_07D_7E_I		
ORIG_FID	LATITUDE	LONGITUDE
1	23° 45' 49.308" N	87° 7' 31.919" E
2	23° 45' 49.732" N	87° 7' 30.731" E
3	23° 45' 50.559" N	87° 7' 28.518" E
4	23° 45' 51.719" N	87° 7' 24.989" E
5	23° 45' 53.152" N	87° 7' 22.239" E
6	23° 45' 54.971" N	87° 7' 20.266" E
7	23° 45' 56.460" N	87° 7' 16.738" E
8	23° 45' 58.389" N	87° 7' 14.526" E
9	23° 46' 2.025" N	87° 7' 13.033" E
10	23° 46' 4.393" N	87° 7' 12.078" E
11	23° 46' 5.716" N	87° 7' 10.045" E
12	23° 46' 7.094" N	87° 7' 8.252" E
13	23° 46' 6.758" N	87° 7' 9.660" E
14	23° 46' 7.598" N	87° 7' 7.838" E
15	23° 45' 56.423" N	87° 7' 22.887" E
16	23° 45' 51.806" N	87° 7' 30.361" E
17	23° 45' 48.535" N	87° 7' 33.052" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

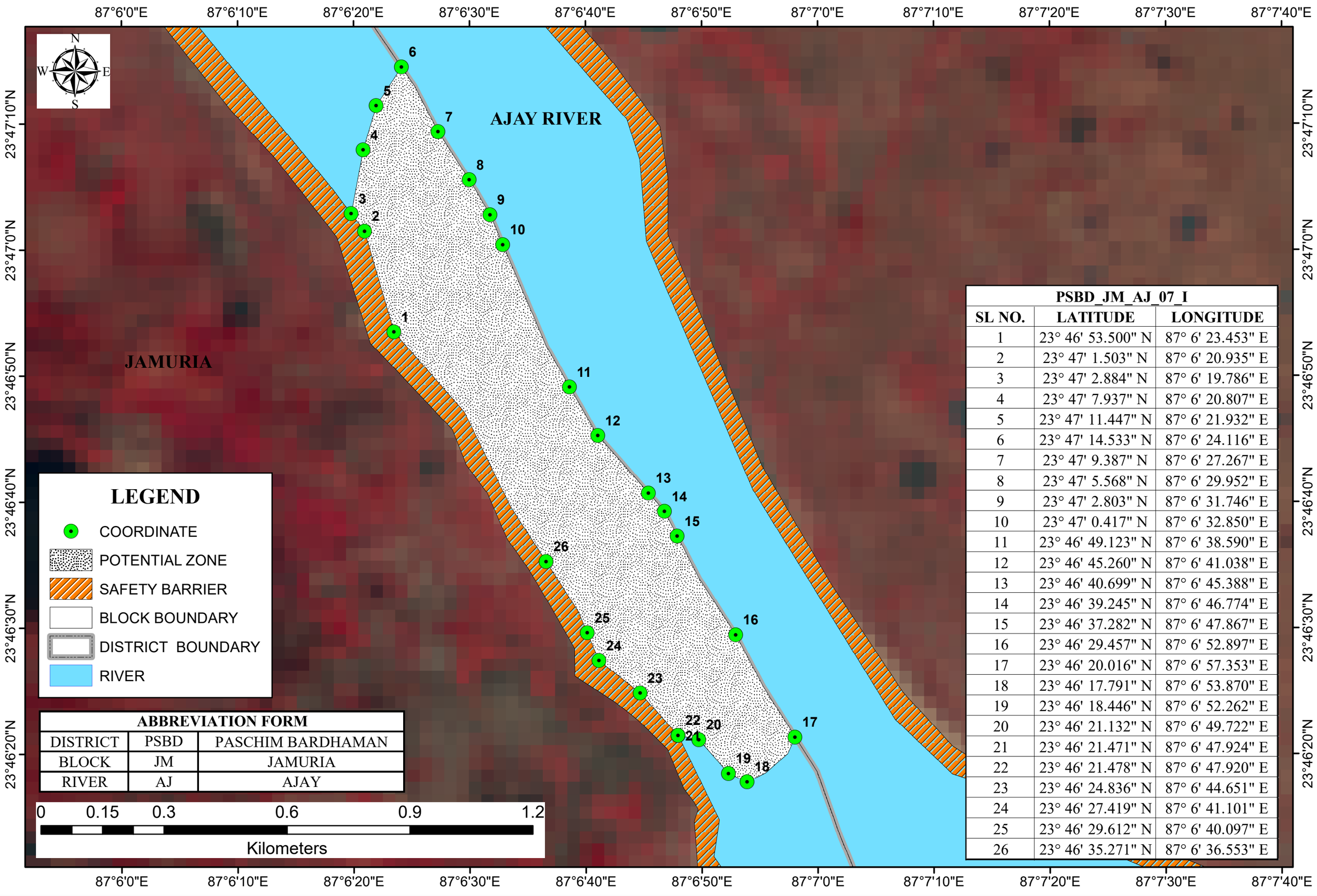
POTENTIAL BLOCK PSBD_JM_AJ_07E OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

PSBD_JM_AJ_07E		
SL.NO.	LATITUDE	LONGITUDE
1	23° 44' 58.892" N	87° 9' 11.893" E
2	23° 44' 58.300" N	87° 9' 11.804" E
3	23° 44' 58.330" N	87° 9' 11.695" E
4	23° 45' 1.521" N	87° 9' 3.847" E
5	23° 45' 5.232" N	87° 8' 52.168" E
6	23° 45' 8.076" N	87° 8' 46.282" E
7	23° 45' 10.164" N	87° 8' 43.035" E
8	23° 45' 11.309" N	87° 8' 42.521" E
9	23° 45' 12.135" N	87° 8' 42.477" E
10	23° 45' 13.044" N	87° 8' 42.567" E
11	23° 45' 13.704" N	87° 8' 43.276" E
12	23° 45' 13.053" N	87° 8' 46.013" E
13	23° 45' 12.744" N	87° 8' 47.531" E
14	23° 45' 12.386" N	87° 8' 50.445" E
15	23° 45' 12.144" N	87° 8' 51.504" E
16	23° 45' 11.898" N	87° 8' 52.581" E
17	23° 45' 10.858" N	87° 8' 55.000" E
18	23° 45' 9.606" N	87° 8' 58.248" E
19	23° 45' 8.735" N	87° 9' 0.085" E
20	23° 45' 8.224" N	87° 9' 1.161" E
21	23° 45' 6.415" N	87° 9' 6.686" E
22	23° 45' 5.415" N	87° 9' 9.265" E
23	23° 45' 4.588" N	87° 9' 10.386" E
24	23° 45' 3.279" N	87° 9' 11.094" E
25	23° 45' 1.834" N	87° 9' 11.205" E
26	23° 45' 0.856" N	87° 9' 11.689" E

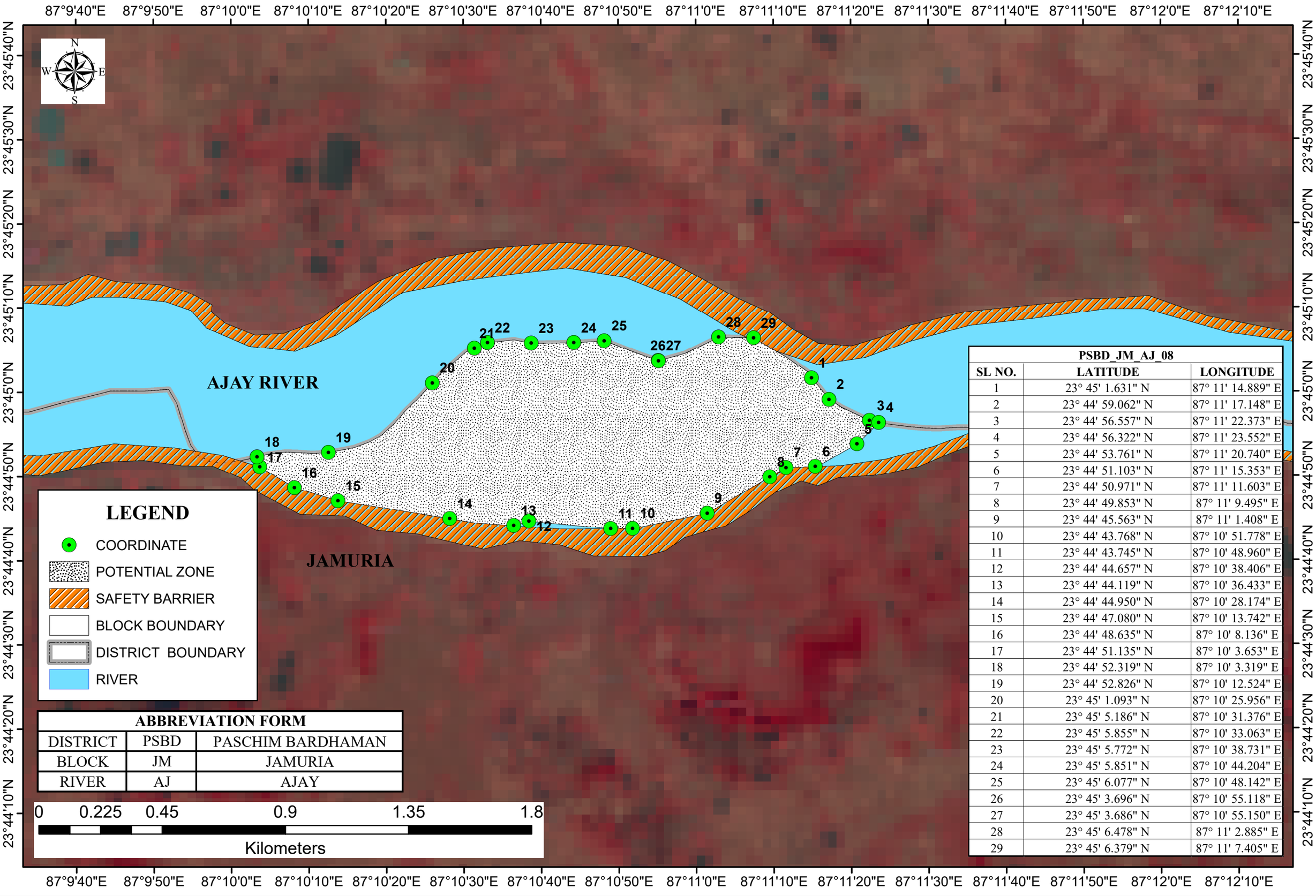
POTENTIAL BLOCK PSBD_JM_AJ_07_I OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

PSBD_JM_AJ_07_I		
SL NO.	LATITUDE	LONGITUDE
1	23° 46' 53.500" N	87° 6' 23.453" E
2	23° 47' 1.503" N	87° 6' 20.935" E
3	23° 47' 2.884" N	87° 6' 19.786" E
4	23° 47' 7.937" N	87° 6' 20.807" E
5	23° 47' 11.447" N	87° 6' 21.932" E
6	23° 47' 14.533" N	87° 6' 24.116" E
7	23° 47' 9.387" N	87° 6' 27.267" E
8	23° 47' 5.568" N	87° 6' 29.952" E
9	23° 47' 2.803" N	87° 6' 31.746" E
10	23° 47' 0.417" N	87° 6' 32.850" E
11	23° 46' 49.123" N	87° 6' 38.590" E
12	23° 46' 45.260" N	87° 6' 41.038" E
13	23° 46' 40.699" N	87° 6' 45.388" E
14	23° 46' 39.245" N	87° 6' 46.774" E
15	23° 46' 37.282" N	87° 6' 47.867" E
16	23° 46' 29.457" N	87° 6' 52.897" E
17	23° 46' 20.016" N	87° 6' 57.353" E
18	23° 46' 17.791" N	87° 6' 53.870" E
19	23° 46' 18.446" N	87° 6' 52.262" E
20	23° 46' 21.132" N	87° 6' 49.722" E
21	23° 46' 21.471" N	87° 6' 47.924" E
22	23° 46' 21.478" N	87° 6' 47.920" E
23	23° 46' 24.836" N	87° 6' 44.651" E
24	23° 46' 27.419" N	87° 6' 41.101" E
25	23° 46' 29.612" N	87° 6' 40.097" E
26	23° 46' 35.271" N	87° 6' 36.553" E

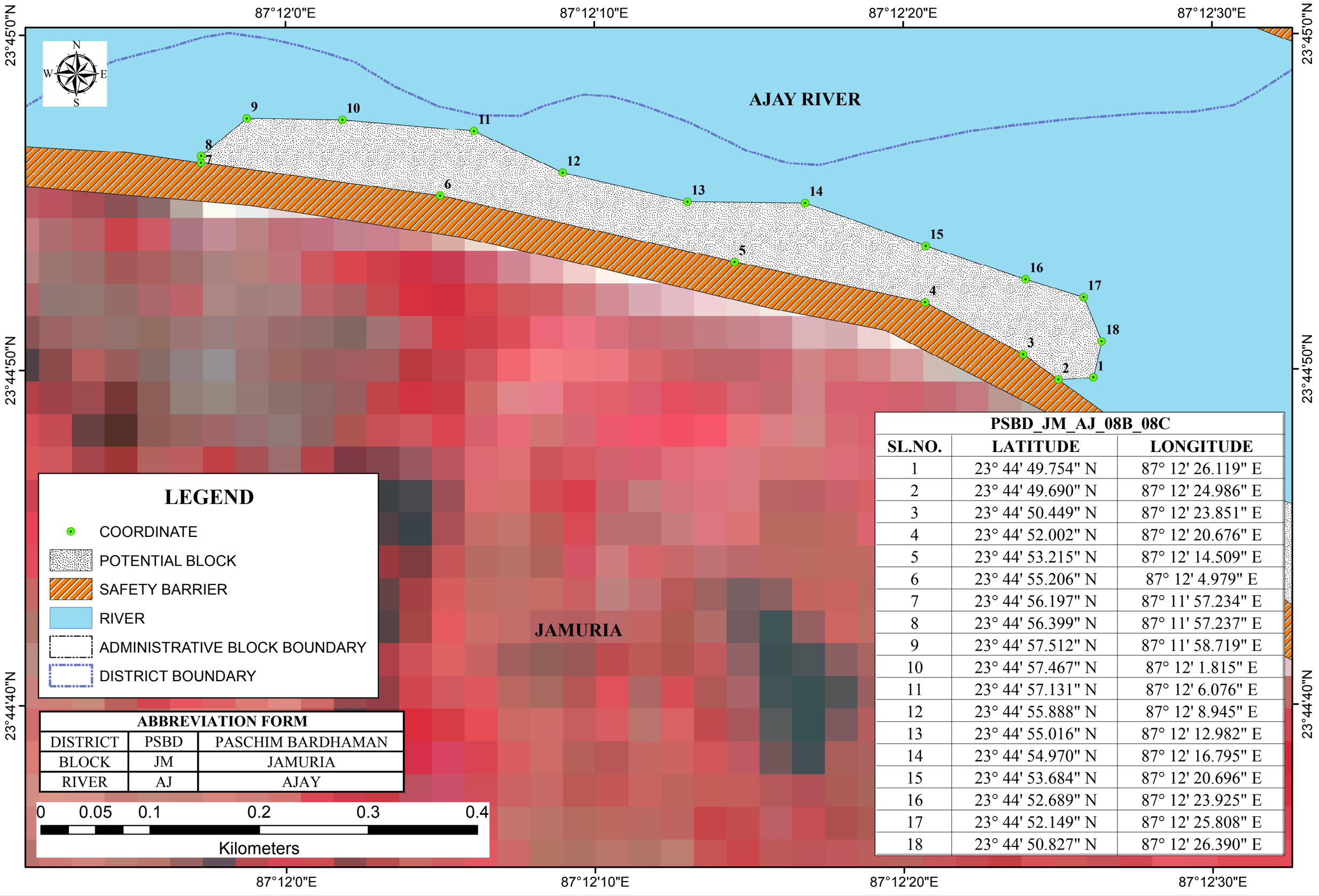
POTENTIAL BLOCK PSBD_JM_AJ_08 OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

PSBD_JM_AJ_08		
SL NO.	LATITUDE	LONGITUDE
1	23° 45' 1.631" N	87° 11' 14.889" E
2	23° 44' 59.062" N	87° 11' 17.148" E
3	23° 44' 56.557" N	87° 11' 22.373" E
4	23° 44' 56.322" N	87° 11' 23.552" E
5	23° 44' 53.761" N	87° 11' 20.740" E
6	23° 44' 51.103" N	87° 11' 15.353" E
7	23° 44' 50.971" N	87° 11' 11.603" E
8	23° 44' 49.853" N	87° 11' 9.495" E
9	23° 44' 45.563" N	87° 11' 1.408" E
10	23° 44' 43.768" N	87° 10' 51.778" E
11	23° 44' 43.745" N	87° 10' 48.960" E
12	23° 44' 44.657" N	87° 10' 38.406" E
13	23° 44' 44.119" N	87° 10' 36.433" E
14	23° 44' 44.950" N	87° 10' 28.174" E
15	23° 44' 47.080" N	87° 10' 13.742" E
16	23° 44' 48.635" N	87° 10' 8.136" E
17	23° 44' 51.135" N	87° 10' 3.653" E
18	23° 44' 52.319" N	87° 10' 3.319" E
19	23° 44' 52.826" N	87° 10' 12.524" E
20	23° 45' 1.093" N	87° 10' 25.956" E
21	23° 45' 5.186" N	87° 10' 31.376" E
22	23° 45' 5.855" N	87° 10' 33.063" E
23	23° 45' 5.772" N	87° 10' 38.731" E
24	23° 45' 5.851" N	87° 10' 44.204" E
25	23° 45' 6.077" N	87° 10' 48.142" E
26	23° 45' 3.696" N	87° 10' 55.118" E
27	23° 45' 3.686" N	87° 10' 55.150" E
28	23° 45' 6.478" N	87° 11' 2.885" E
29	23° 45' 6.379" N	87° 11' 7.405" E

POTENTIAL BLOCK PSBD_JM_AJ_08B_08C OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

PSBD_JM_AJ_08B_08C		
SL.NO.	LATITUDE	LONGITUDE
1	23° 44' 49.754" N	87° 12' 26.119" E
2	23° 44' 49.690" N	87° 12' 24.986" E
3	23° 44' 50.449" N	87° 12' 23.851" E
4	23° 44' 52.002" N	87° 12' 20.676" E
5	23° 44' 53.215" N	87° 12' 14.509" E
6	23° 44' 55.206" N	87° 12' 4.979" E
7	23° 44' 56.197" N	87° 11' 57.234" E
8	23° 44' 56.399" N	87° 11' 57.237" E
9	23° 44' 57.512" N	87° 11' 58.719" E
10	23° 44' 57.467" N	87° 12' 1.815" E
11	23° 44' 57.131" N	87° 12' 6.076" E
12	23° 44' 55.888" N	87° 12' 8.945" E
13	23° 44' 55.016" N	87° 12' 12.982" E
14	23° 44' 54.970" N	87° 12' 16.795" E
15	23° 44' 53.684" N	87° 12' 20.696" E
16	23° 44' 52.689" N	87° 12' 23.925" E
17	23° 44' 52.149" N	87° 12' 25.808" E
18	23° 44' 50.827" N	87° 12' 26.390" E

POTENTIAL BLOCK PSBD_JM_AJ_08D OF AJAY RIVER

87°12'40"E 87°12'50"E 87°13'0"E 87°13'10"E

23°44'40"N

AJAY RIVER

PSBD_JM_AJ_08D

JAMURIA

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

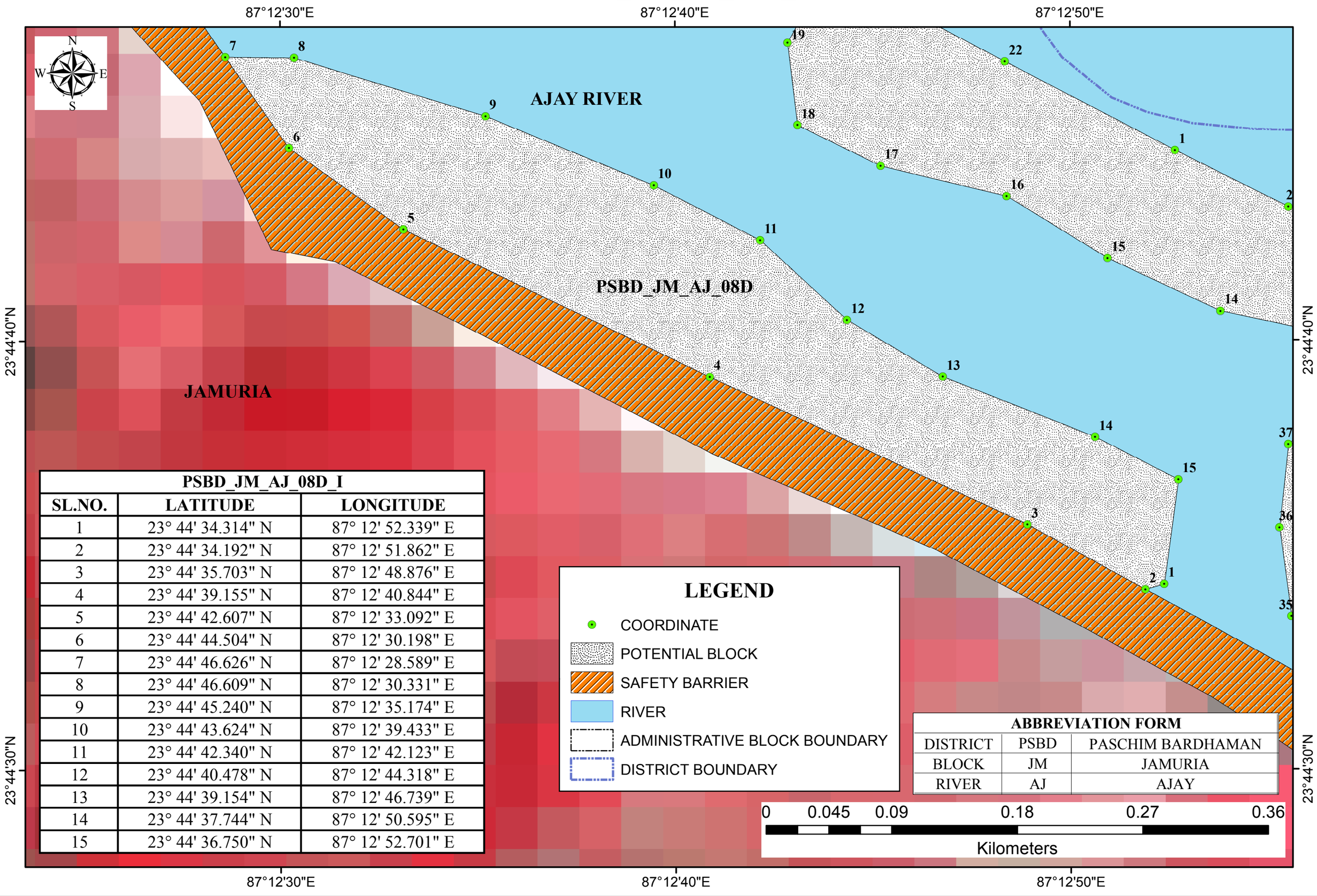
ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

0 0.0425 0.085 0.17 0.255 0.34

Kilometers

PSBD_JM_AJ_08D					
SL.NO.	LATITUDE	LONGITUDE	SL.NO.	LATITUDE	LONGITUDE
1	23° 44' 44.432" N	87° 12' 52.624" E	12	23° 44' 39.960" N	87° 13' 0.872" E
2	23° 44' 43.106" N	87° 12' 55.493" E	13	23° 44' 39.965" N	87° 12' 57.372" E
3	23° 44' 43.558" N	87° 13' 0.458" E	14	23° 44' 40.680" N	87° 12' 53.775" E
4	23° 44' 43.294" N	87° 13' 1.256" E	15	23° 44' 41.915" N	87° 12' 50.915" E
5	23° 44' 43.042" N	87° 13' 2.103" E	16	23° 44' 43.364" N	87° 12' 48.361" E
6	23° 44' 42.790" N	87° 13' 2.951" E	17	23° 44' 44.070" N	87° 12' 45.177" E
7	23° 44' 42.595" N	87° 13' 3.427" E	18	23° 44' 45.023" N	87° 12' 43.069" E
8	23° 44' 41.879" N	87° 13' 4.362" E	19	23° 44' 46.945" N	87° 12' 42.820" E
9	23° 44' 40.529" N	87° 13' 5.227" E	20	23° 44' 47.756" N	87° 12' 43.311" E
10	23° 44' 40.456" N	87° 13' 5.280" E	21	23° 44' 47.786" N	87° 12' 45.676" E
11	23° 44' 39.790" N	87° 13' 4.416" E	22	23° 44' 46.502" N	87° 12' 48.321" E

POTENTIAL BLOCK PSBD_JM_AJ_08D_I OF AJAY RIVER



PSBD_JM_AJ_08D_I		
SL.NO.	LATITUDE	LONGITUDE
1	23° 44' 34.314" N	87° 12' 52.339" E
2	23° 44' 34.192" N	87° 12' 51.862" E
3	23° 44' 35.703" N	87° 12' 48.876" E
4	23° 44' 39.155" N	87° 12' 40.844" E
5	23° 44' 42.607" N	87° 12' 33.092" E
6	23° 44' 44.504" N	87° 12' 30.198" E
7	23° 44' 46.626" N	87° 12' 28.589" E
8	23° 44' 46.609" N	87° 12' 30.331" E
9	23° 44' 45.240" N	87° 12' 35.174" E
10	23° 44' 43.624" N	87° 12' 39.433" E
11	23° 44' 42.340" N	87° 12' 42.123" E
12	23° 44' 40.478" N	87° 12' 44.318" E
13	23° 44' 39.154" N	87° 12' 46.739" E
14	23° 44' 37.744" N	87° 12' 50.595" E
15	23° 44' 36.750" N	87° 12' 52.701" E

LEGEND

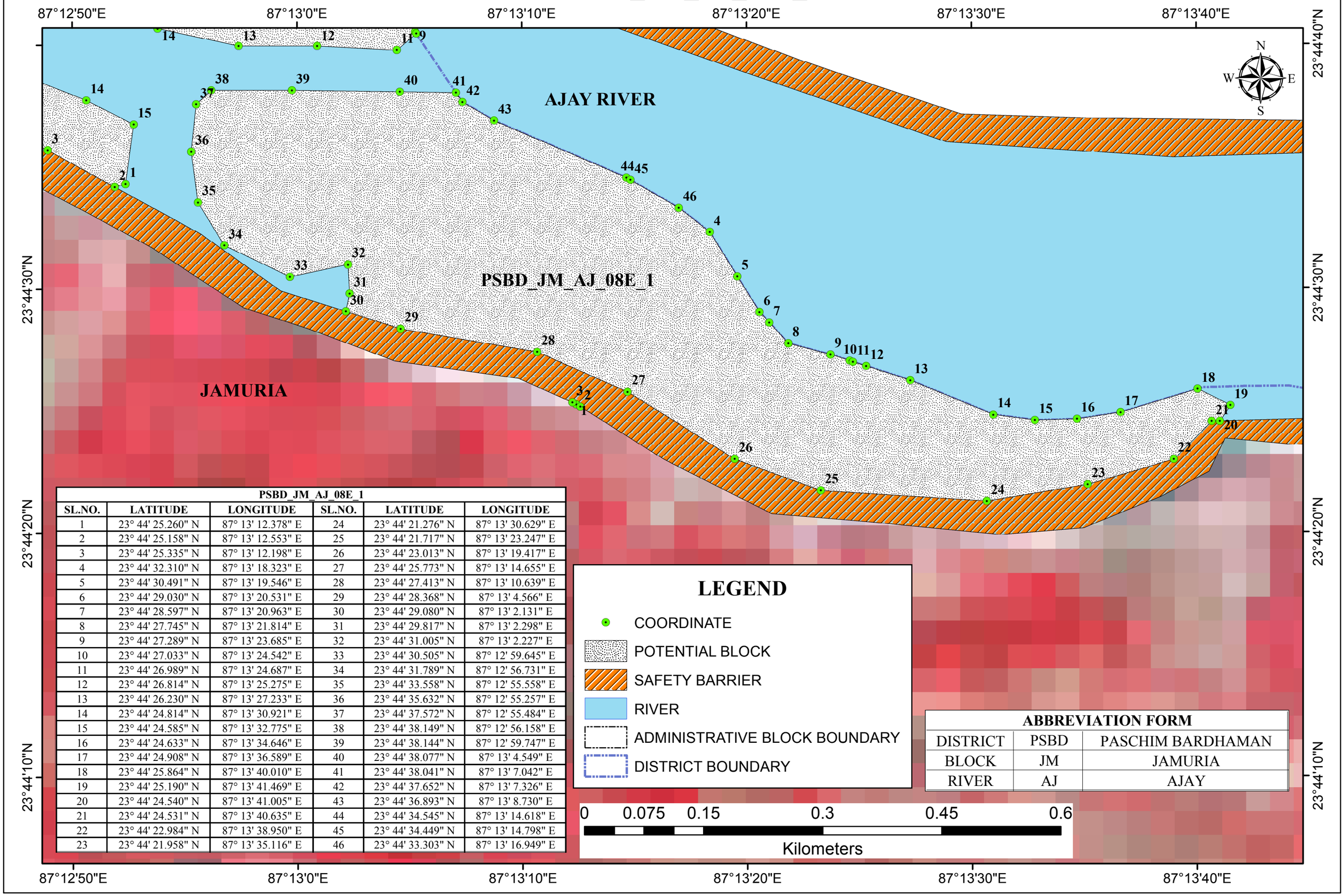
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

0 0.045 0.09 0.18 0.27 0.36

Kilometers

POTENTIAL BLOCK PSBD_JM_AJ_08E_1 OF AJAY RIVER



PSBD_JM_AJ_08E_1					
SL.NO.	LATITUDE	LONGITUDE	SL.NO.	LATITUDE	LONGITUDE
1	23° 44' 25.260" N	87° 13' 12.378" E	24	23° 44' 21.276" N	87° 13' 30.629" E
2	23° 44' 25.158" N	87° 13' 12.553" E	25	23° 44' 21.717" N	87° 13' 23.247" E
3	23° 44' 25.335" N	87° 13' 12.198" E	26	23° 44' 23.013" N	87° 13' 19.417" E
4	23° 44' 32.310" N	87° 13' 18.323" E	27	23° 44' 25.773" N	87° 13' 14.655" E
5	23° 44' 30.491" N	87° 13' 19.546" E	28	23° 44' 27.413" N	87° 13' 10.639" E
6	23° 44' 29.030" N	87° 13' 20.531" E	29	23° 44' 28.368" N	87° 13' 4.566" E
7	23° 44' 28.597" N	87° 13' 20.963" E	30	23° 44' 29.080" N	87° 13' 2.131" E
8	23° 44' 27.745" N	87° 13' 21.814" E	31	23° 44' 29.817" N	87° 13' 2.298" E
9	23° 44' 27.289" N	87° 13' 23.685" E	32	23° 44' 31.005" N	87° 13' 2.227" E
10	23° 44' 27.033" N	87° 13' 24.542" E	33	23° 44' 30.505" N	87° 12' 59.645" E
11	23° 44' 26.989" N	87° 13' 24.687" E	34	23° 44' 31.789" N	87° 12' 56.731" E
12	23° 44' 26.814" N	87° 13' 25.275" E	35	23° 44' 33.558" N	87° 12' 55.558" E
13	23° 44' 26.230" N	87° 13' 27.233" E	36	23° 44' 35.632" N	87° 12' 55.257" E
14	23° 44' 24.814" N	87° 13' 30.921" E	37	23° 44' 37.572" N	87° 12' 55.484" E
15	23° 44' 24.585" N	87° 13' 32.775" E	38	23° 44' 38.149" N	87° 12' 56.158" E
16	23° 44' 24.633" N	87° 13' 34.646" E	39	23° 44' 38.144" N	87° 12' 59.747" E
17	23° 44' 24.908" N	87° 13' 36.589" E	40	23° 44' 38.077" N	87° 13' 4.549" E
18	23° 44' 25.864" N	87° 13' 40.010" E	41	23° 44' 38.041" N	87° 13' 7.042" E
19	23° 44' 25.190" N	87° 13' 41.469" E	42	23° 44' 37.652" N	87° 13' 7.326" E
20	23° 44' 24.540" N	87° 13' 41.005" E	43	23° 44' 36.893" N	87° 13' 8.730" E
21	23° 44' 24.531" N	87° 13' 40.635" E	44	23° 44' 34.545" N	87° 13' 14.618" E
22	23° 44' 22.984" N	87° 13' 38.950" E	45	23° 44' 34.449" N	87° 13' 14.798" E
23	23° 44' 21.958" N	87° 13' 35.116" E	46	23° 44' 33.303" N	87° 13' 16.949" E

LEGEND

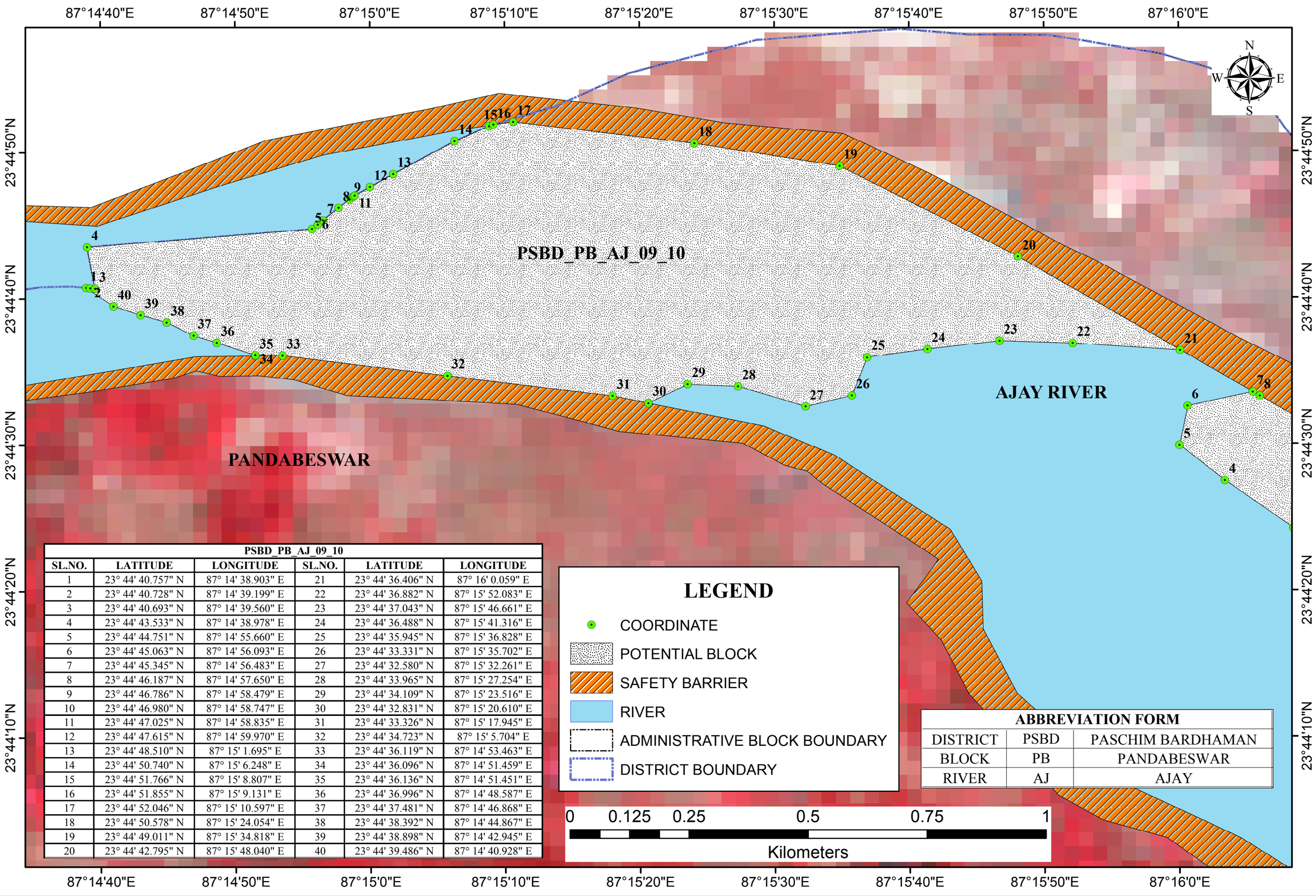
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	JM	JAMURIA
RIVER	AJ	AJAY

0 0.075 0.15 0.3 0.45 0.6

Kilometers

POTENTIAL BLOCK PSBD_PB_AJ_09_10 OF AJAY RIVER



PSBD_PB_AJ_09_10					
SL.NO.	LATITUDE	LONGITUDE	SL.NO.	LATITUDE	LONGITUDE
1	23° 44' 40.757" N	87° 14' 38.903" E	21	23° 44' 36.406" N	87° 16' 0.059" E
2	23° 44' 40.728" N	87° 14' 39.199" E	22	23° 44' 36.882" N	87° 15' 52.083" E
3	23° 44' 40.693" N	87° 14' 39.560" E	23	23° 44' 37.043" N	87° 15' 46.661" E
4	23° 44' 43.533" N	87° 14' 38.978" E	24	23° 44' 36.488" N	87° 15' 41.316" E
5	23° 44' 44.751" N	87° 14' 55.660" E	25	23° 44' 35.945" N	87° 15' 36.828" E
6	23° 44' 45.063" N	87° 14' 56.093" E	26	23° 44' 33.331" N	87° 15' 35.702" E
7	23° 44' 45.345" N	87° 14' 56.483" E	27	23° 44' 32.580" N	87° 15' 32.261" E
8	23° 44' 46.187" N	87° 14' 57.650" E	28	23° 44' 33.965" N	87° 15' 27.254" E
9	23° 44' 46.786" N	87° 14' 58.479" E	29	23° 44' 34.109" N	87° 15' 23.516" E
10	23° 44' 46.980" N	87° 14' 58.747" E	30	23° 44' 32.831" N	87° 15' 20.610" E
11	23° 44' 47.025" N	87° 14' 58.835" E	31	23° 44' 33.326" N	87° 15' 17.945" E
12	23° 44' 47.615" N	87° 14' 59.970" E	32	23° 44' 34.723" N	87° 15' 5.704" E
13	23° 44' 48.510" N	87° 15' 1.695" E	33	23° 44' 36.119" N	87° 14' 53.463" E
14	23° 44' 50.740" N	87° 15' 6.248" E	34	23° 44' 36.096" N	87° 14' 51.459" E
15	23° 44' 51.766" N	87° 15' 8.807" E	35	23° 44' 36.136" N	87° 14' 51.451" E
16	23° 44' 51.855" N	87° 15' 9.131" E	36	23° 44' 36.996" N	87° 14' 48.587" E
17	23° 44' 52.046" N	87° 15' 10.597" E	37	23° 44' 37.481" N	87° 14' 46.868" E
18	23° 44' 50.578" N	87° 15' 24.054" E	38	23° 44' 38.392" N	87° 14' 44.867" E
19	23° 44' 49.011" N	87° 15' 34.818" E	39	23° 44' 38.898" N	87° 14' 42.945" E
20	23° 44' 42.795" N	87° 15' 48.040" E	40	23° 44' 39.486" N	87° 14' 40.928" E

LEGEND

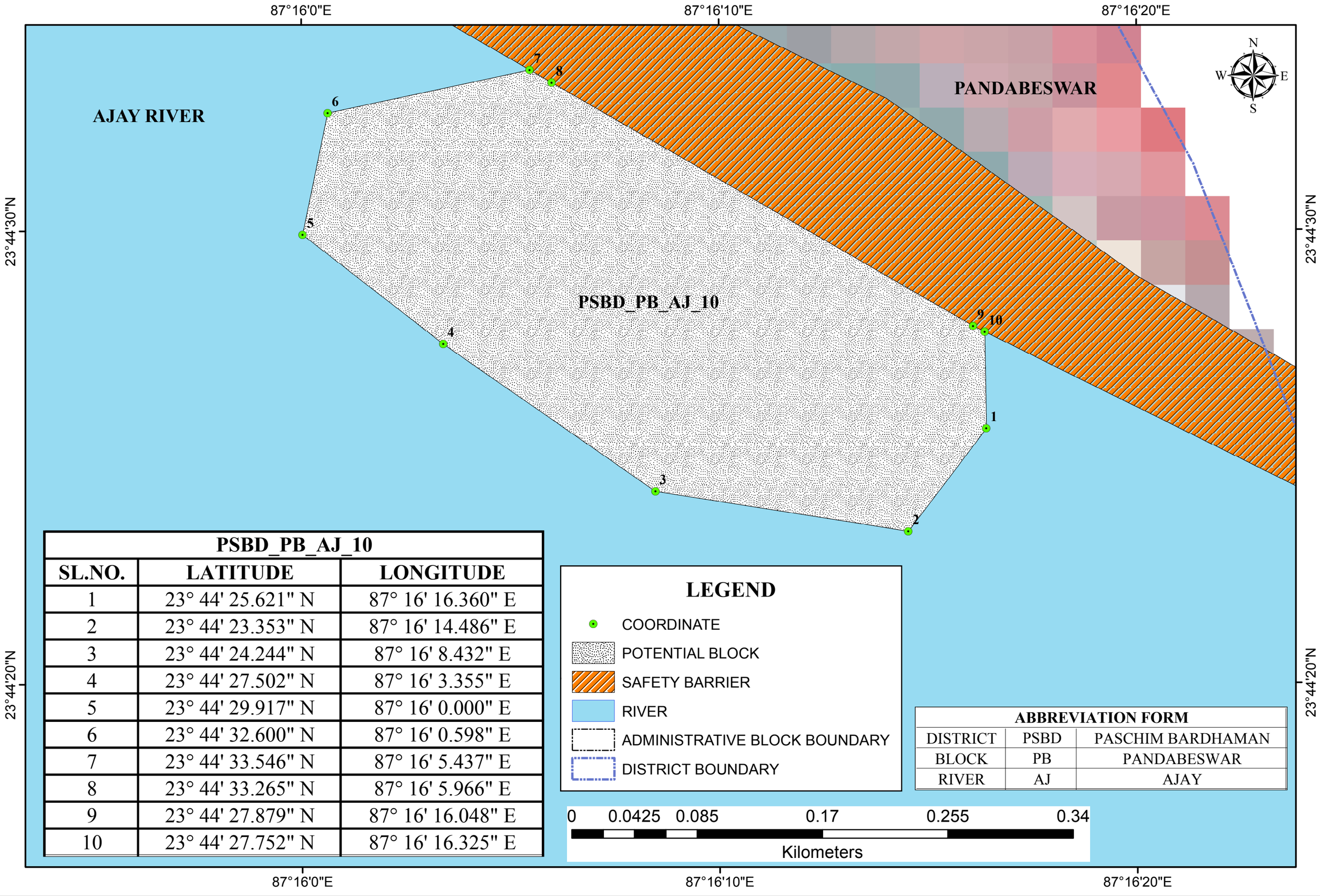
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.125 0.25 0.5 0.75 1

Kilometers

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	PB	PANDABESWAR
RIVER	AJ	AJAY

POTENTIAL BLOCK PSBD_PB_AJ_10 OF AJAY RIVER



PSBD_PB_AJ_10		
SL.NO.	LATITUDE	LONGITUDE
1	23° 44' 25.621" N	87° 16' 16.360" E
2	23° 44' 23.353" N	87° 16' 14.486" E
3	23° 44' 24.244" N	87° 16' 8.432" E
4	23° 44' 27.502" N	87° 16' 3.355" E
5	23° 44' 29.917" N	87° 16' 0.000" E
6	23° 44' 32.600" N	87° 16' 0.598" E
7	23° 44' 33.546" N	87° 16' 5.437" E
8	23° 44' 33.265" N	87° 16' 5.966" E
9	23° 44' 27.879" N	87° 16' 16.048" E
10	23° 44' 27.752" N	87° 16' 16.325" E

LEGEND

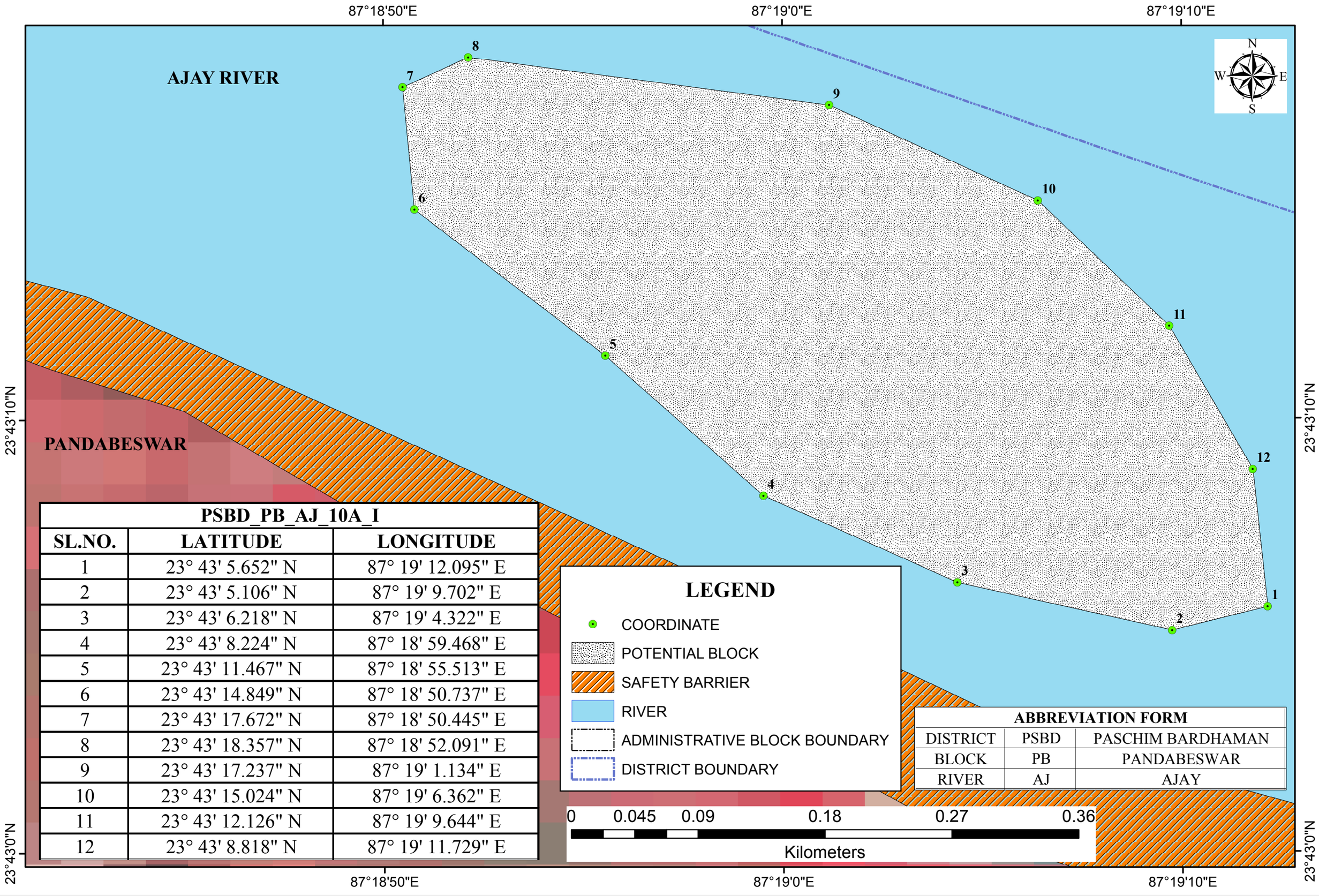
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	PB	PANDABESWAR
RIVER	AJ	AJAY

0 0.0425 0.085 0.17 0.255 0.34

Kilometers

POTENTIAL BLOCK PSBD_PB_AJ_10A_I OF AJAY RIVER



PSBD_PB_AJ_10A_I		
SL.NO.	LATITUDE	LONGITUDE
1	23° 43' 5.652" N	87° 19' 12.095" E
2	23° 43' 5.106" N	87° 19' 9.702" E
3	23° 43' 6.218" N	87° 19' 4.322" E
4	23° 43' 8.224" N	87° 18' 59.468" E
5	23° 43' 11.467" N	87° 18' 55.513" E
6	23° 43' 14.849" N	87° 18' 50.737" E
7	23° 43' 17.672" N	87° 18' 50.445" E
8	23° 43' 18.357" N	87° 18' 52.091" E
9	23° 43' 17.237" N	87° 19' 1.134" E
10	23° 43' 15.024" N	87° 19' 6.362" E
11	23° 43' 12.126" N	87° 19' 9.644" E
12	23° 43' 8.818" N	87° 19' 11.729" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	PB	PANDABESWAR
RIVER	AJ	AJAY

POTENTIAL BLOCK PSBD_FR_AJ_10A_II OF AJAY RIVER

87°19'20"E 87°19'30"E 87°19'40"E

23°43'0"N

23°42'50"N

AJAY RIVER

FARIDPUR

N W E S

PSBD_FR_AJ_10A_II		
SL.NO.	LATITUDE	LONGITUDE
1	23° 42' 59.974" N	87° 19' 28.079" E
2	23° 42' 59.190" N	87° 19' 23.646" E
3	23° 42' 59.526" N	87° 19' 21.208" E
4	23° 43' 0.338" N	87° 19' 18.810" E
5	23° 43' 0.754" N	87° 19' 18.388" E
6	23° 43' 2.545" N	87° 19' 16.573" E
7	23° 43' 4.610" N	87° 19' 16.727" E
8	23° 43' 5.290" N	87° 19' 20.467" E
9	23° 43' 5.331" N	87° 19' 20.811" E
10	23° 43' 5.831" N	87° 19' 25.028" E
11	23° 43' 6.372" N	87° 19' 29.515" E
12	23° 43' 7.155" N	87° 19' 37.356" E
13	23° 43' 6.830" N	87° 19' 38.338" E
14	23° 43' 6.258" N	87° 19' 39.844" E
15	23° 43' 5.407" N	87° 19' 42.083" E
16	23° 43' 5.124" N	87° 19' 42.827" E
17	23° 43' 4.350" N	87° 19' 41.845" E
18	23° 43' 2.707" N	87° 19' 37.878" E
19	23° 43' 1.339" N	87° 19' 33.764" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	FR	FARIDPUR
RIVER	AJ	AJAY

0 0.045 0.09 0.18 0.27 0.36

Kilometers

POTENTIAL BLOCK PSBD_FR_AJ_10B_I OF AJAY RIVER

87°20'0"E 87°20'10"E 87°20'20"E 87°20'30"E

23°43'10"N

23°43'0"N

AJAY RIVER

FARIDPUR

PSBD_FR_AJ_10B_I		
SL.NO.	LATITUDE	LONGITUDE
1	23° 43' 8.540" N	87° 20' 2.591" E
2	23° 43' 8.771" N	87° 20' 3.046" E
3	23° 43' 13.871" N	87° 20' 16.102" E
4	23° 43' 15.457" N	87° 20' 19.355" E
5	23° 43' 13.837" N	87° 20' 18.412" E
6	23° 43' 12.331" N	87° 20' 14.894" E
7	23° 43' 11.785" N	87° 20' 12.800" E
8	23° 43' 10.620" N	87° 20' 10.255" E
9	23° 43' 9.248" N	87° 20' 8.233" E
10	23° 43' 7.532" N	87° 20' 6.210" E
11	23° 43' 6.300" N	87° 20' 3.379" E
12	23° 43' 5.334" N	87° 20' 4.423" E
13	23° 43' 4.505" N	87° 20' 5.991" E
14	23° 43' 2.954" N	87° 20' 5.882" E
15	23° 43' 0.563" N	87° 19' 58.656" E
16	23° 43' 0.316" N	87° 19' 54.891" E
17	23° 43' 1.501" N	87° 19' 54.845" E
18	23° 43' 2.598" N	87° 19' 56.567" E
19	23° 43' 3.700" N	87° 19' 56.121" E
20	23° 43' 4.396" N	87° 19' 55.103" E
21	23° 43' 4.966" N	87° 19' 56.017" E
22	23° 43' 7.243" N	87° 20' 0.041" E
23	23° 43' 8.017" N	87° 20' 1.563" E
24	23° 43' 8.493" N	87° 20' 2.499" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	FR	FARIDPUR
RIVER	AJ	AJAY

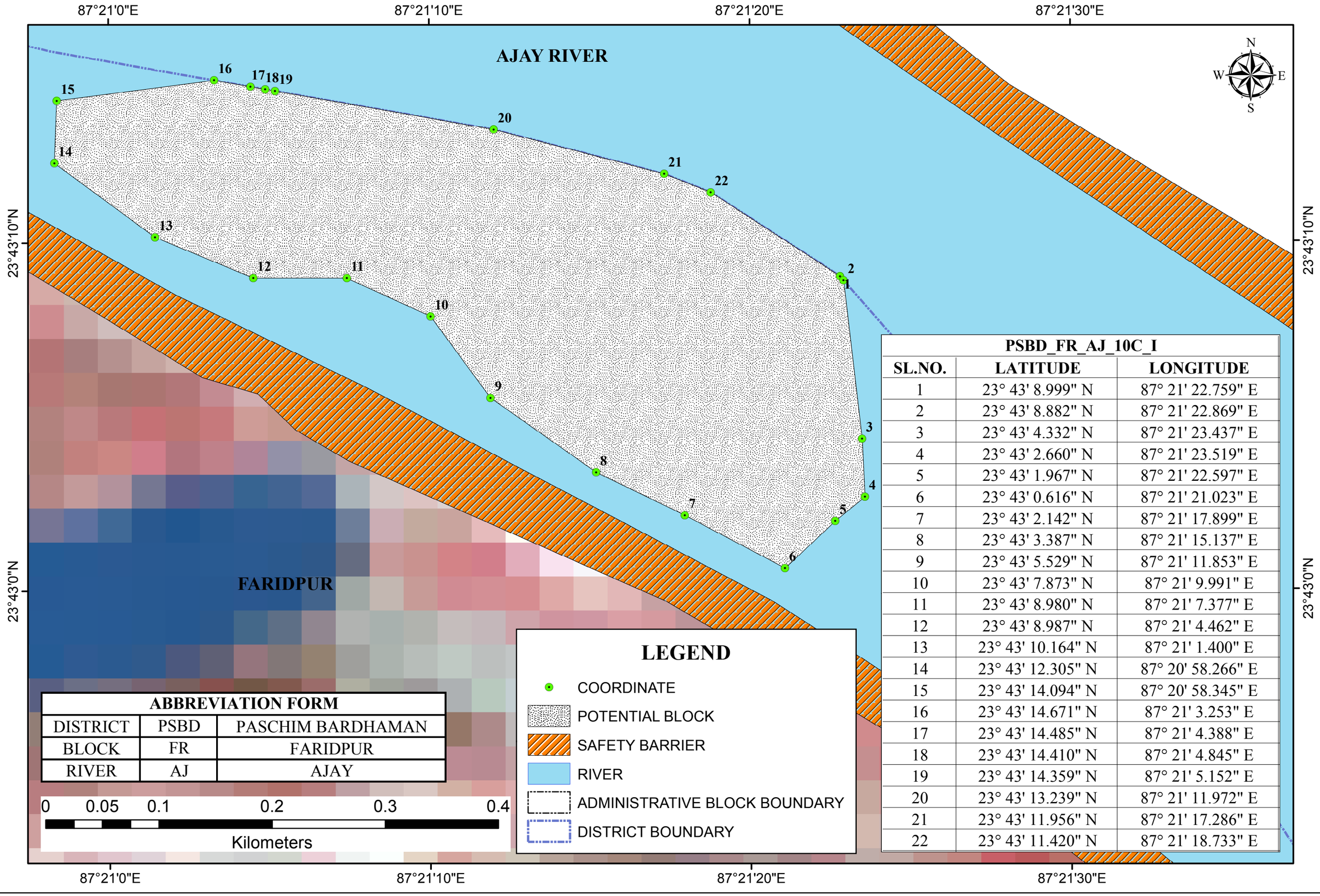
0 0.05 0.1 0.2 0.3 0.4

Kilometers

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

POTENTIAL BLOCK PSBD_FR_AJ_10C_I OF AJAY RIVER



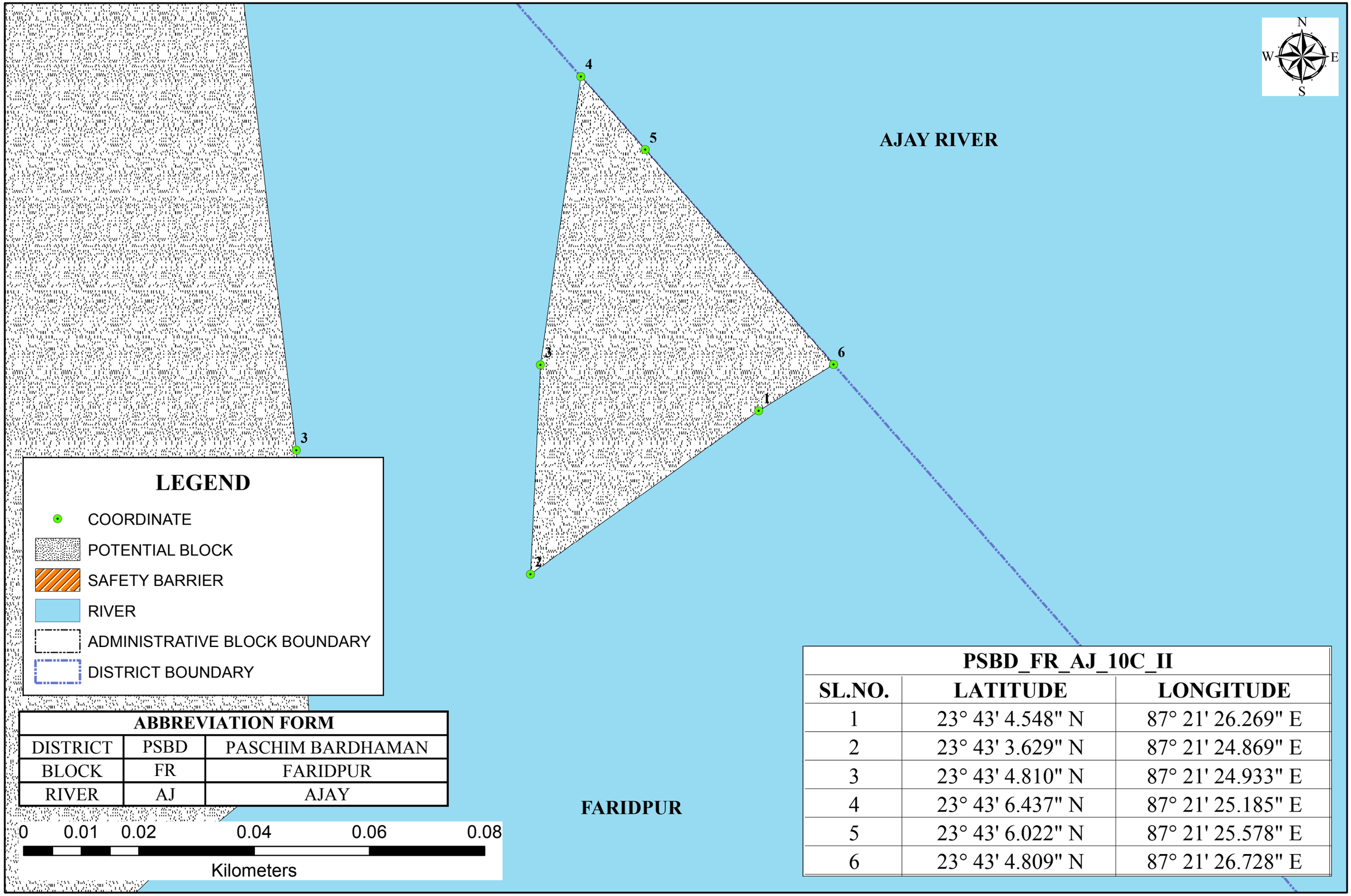
PSBD_FR_AJ_10C_I		
SL.NO.	LATITUDE	LONGITUDE
1	23° 43' 8.999" N	87° 21' 22.759" E
2	23° 43' 8.882" N	87° 21' 22.869" E
3	23° 43' 4.332" N	87° 21' 23.437" E
4	23° 43' 2.660" N	87° 21' 23.519" E
5	23° 43' 1.967" N	87° 21' 22.597" E
6	23° 43' 0.616" N	87° 21' 21.023" E
7	23° 43' 2.142" N	87° 21' 17.899" E
8	23° 43' 3.387" N	87° 21' 15.137" E
9	23° 43' 5.529" N	87° 21' 11.853" E
10	23° 43' 7.873" N	87° 21' 9.991" E
11	23° 43' 8.980" N	87° 21' 7.377" E
12	23° 43' 8.987" N	87° 21' 4.462" E
13	23° 43' 10.164" N	87° 21' 1.400" E
14	23° 43' 12.305" N	87° 20' 58.266" E
15	23° 43' 14.094" N	87° 20' 58.345" E
16	23° 43' 14.671" N	87° 21' 3.253" E
17	23° 43' 14.485" N	87° 21' 4.388" E
18	23° 43' 14.410" N	87° 21' 4.845" E
19	23° 43' 14.359" N	87° 21' 5.152" E
20	23° 43' 13.239" N	87° 21' 11.972" E
21	23° 43' 11.956" N	87° 21' 17.286" E
22	23° 43' 11.420" N	87° 21' 18.733" E

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	FR	FARIDPUR
RIVER	AJ	AJAY

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

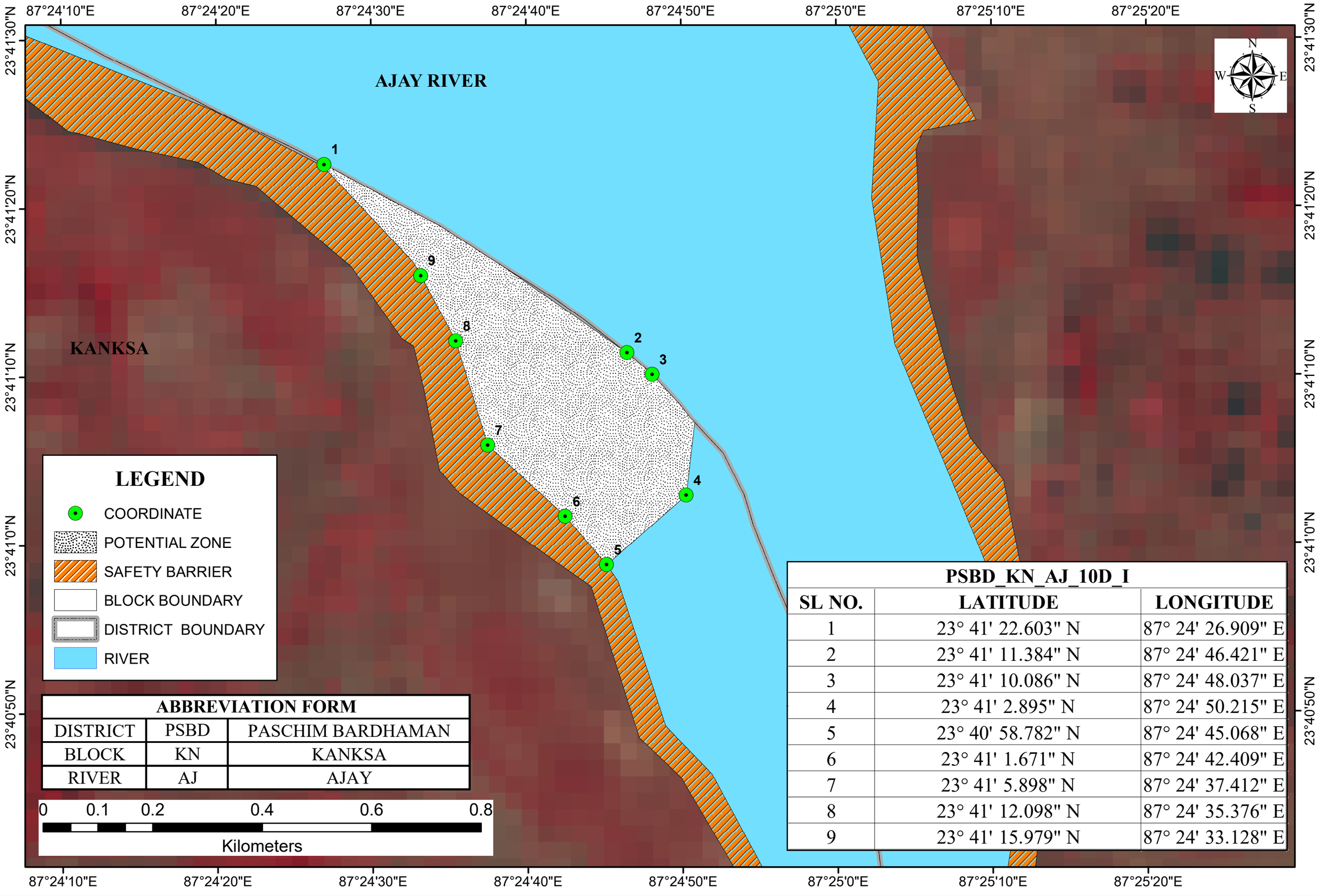
POTENTIAL BLOCK PSBD_FR_AJ_10C_II OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	FR	FARIDPUR
RIVER	AJ	AJAY

PSBD_FR_AJ_10C_II		
SL.NO.	LATITUDE	LONGITUDE
1	23° 43' 4.548" N	87° 21' 26.269" E
2	23° 43' 3.629" N	87° 21' 24.869" E
3	23° 43' 4.810" N	87° 21' 24.933" E
4	23° 43' 6.437" N	87° 21' 25.185" E
5	23° 43' 6.022" N	87° 21' 25.578" E
6	23° 43' 4.809" N	87° 21' 26.728" E

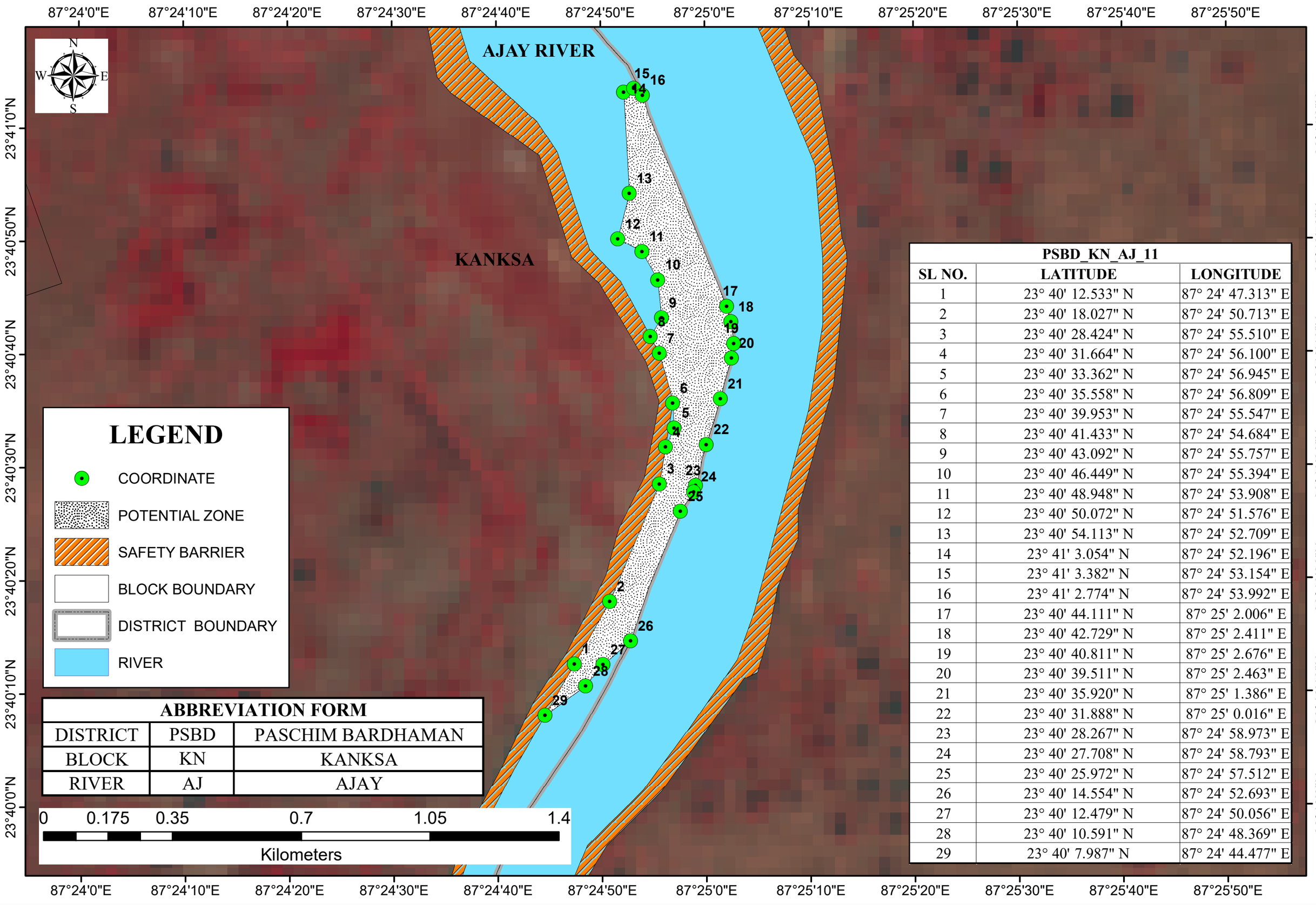
POTENTIAL BLOCK PSBD_KN_AJ_10D_I OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	KN	KANKSA
RIVER	AJ	AJAY

PSBD_KN_AJ_10D_I		
SL NO.	LATITUDE	LONGITUDE
1	23° 41' 22.603" N	87° 24' 26.909" E
2	23° 41' 11.384" N	87° 24' 46.421" E
3	23° 41' 10.086" N	87° 24' 48.037" E
4	23° 41' 2.895" N	87° 24' 50.215" E
5	23° 40' 58.782" N	87° 24' 45.068" E
6	23° 41' 1.671" N	87° 24' 42.409" E
7	23° 41' 5.898" N	87° 24' 37.412" E
8	23° 41' 12.098" N	87° 24' 35.376" E
9	23° 41' 15.979" N	87° 24' 33.128" E

POTENTIAL BLOCK PSBD_KN_AJ_11 OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	KN	KANKSA
RIVER	AJ	AJAY

PSBD_KN_AJ_11		
SL NO.	LATITUDE	LONGITUDE
1	23° 40' 12.533" N	87° 24' 47.313" E
2	23° 40' 18.027" N	87° 24' 50.713" E
3	23° 40' 28.424" N	87° 24' 55.510" E
4	23° 40' 31.664" N	87° 24' 56.100" E
5	23° 40' 33.362" N	87° 24' 56.945" E
6	23° 40' 35.558" N	87° 24' 56.809" E
7	23° 40' 39.953" N	87° 24' 55.547" E
8	23° 40' 41.433" N	87° 24' 54.684" E
9	23° 40' 43.092" N	87° 24' 55.757" E
10	23° 40' 46.449" N	87° 24' 55.394" E
11	23° 40' 48.948" N	87° 24' 53.908" E
12	23° 40' 50.072" N	87° 24' 51.576" E
13	23° 40' 54.113" N	87° 24' 52.709" E
14	23° 41' 3.054" N	87° 24' 52.196" E
15	23° 41' 3.382" N	87° 24' 53.154" E
16	23° 41' 2.774" N	87° 24' 53.992" E
17	23° 40' 44.111" N	87° 25' 2.006" E
18	23° 40' 42.729" N	87° 25' 2.411" E
19	23° 40' 40.811" N	87° 25' 2.676" E
20	23° 40' 39.511" N	87° 25' 2.463" E
21	23° 40' 35.920" N	87° 25' 1.386" E
22	23° 40' 31.888" N	87° 25' 0.016" E
23	23° 40' 28.267" N	87° 24' 58.973" E
24	23° 40' 27.708" N	87° 24' 58.793" E
25	23° 40' 25.972" N	87° 24' 57.512" E
26	23° 40' 14.554" N	87° 24' 52.693" E
27	23° 40' 12.479" N	87° 24' 50.056" E
28	23° 40' 10.591" N	87° 24' 48.369" E
29	23° 40' 7.987" N	87° 24' 44.477" E

POTENTIAL BLOCK PSBD_KN_AJ_12 OF AJAY RIVER

87°24'20"E 87°24'30"E 87°24'40"E 87°24'50"E

23°40'0"N 23°39'50"N 23°39'40"N

KANKSA

AJAY RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

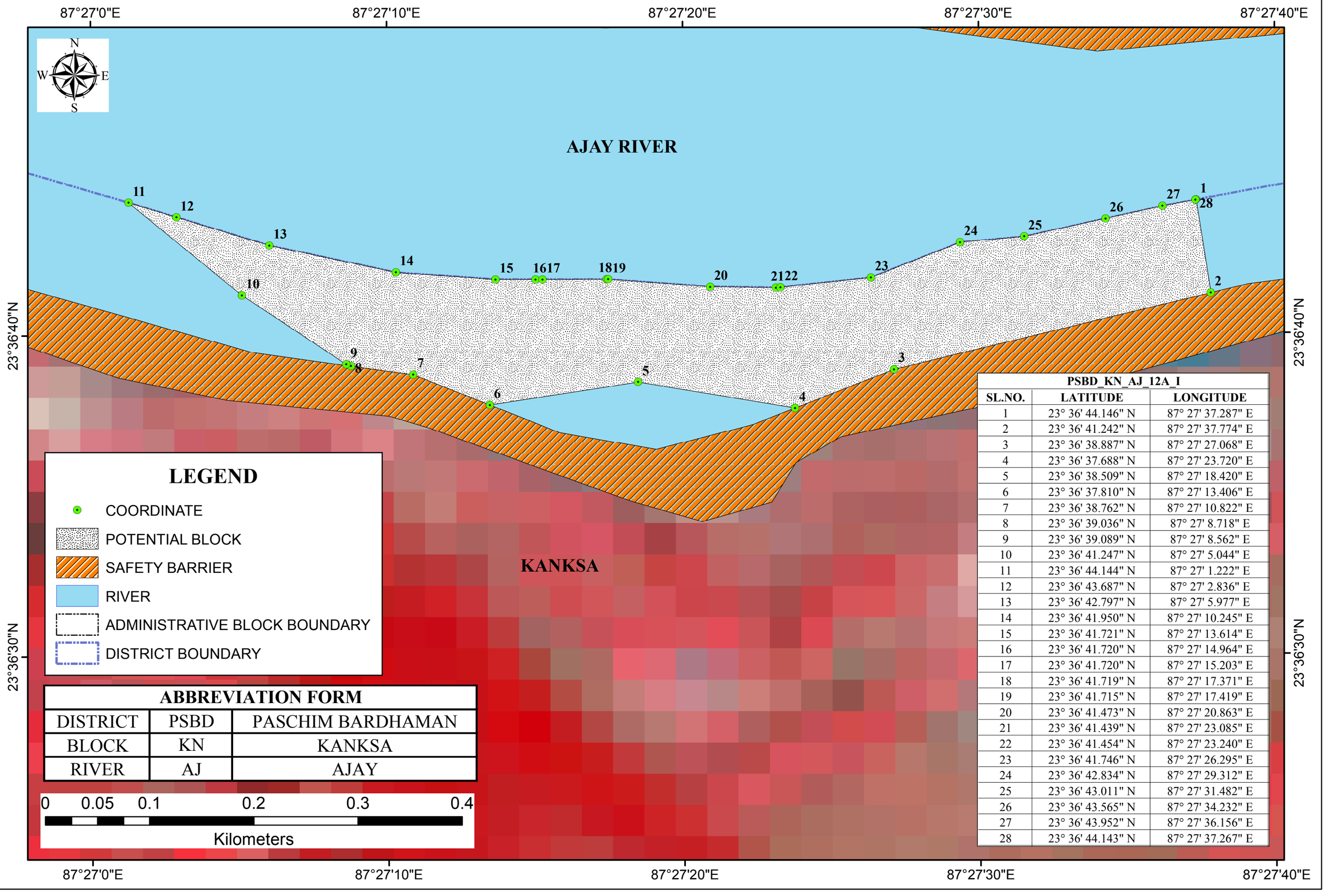
ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	KN	KANKSA
RIVER	AJ	AJAY

0 0.05 0.1 0.2 0.3 0.4

Kilometers

PSBD_KN_AJ_12		
SL.NO.	LATITUDE	LONGITUDE
1	23° 39' 39.774" N	87° 24' 34.231" E
2	23° 39' 38.046" N	87° 24' 34.261" E
3	23° 39' 38.919" N	87° 24' 34.009" E
4	23° 39' 41.244" N	87° 24' 33.800" E
5	23° 39' 43.738" N	87° 24' 33.576" E
6	23° 39' 46.470" N	87° 24' 33.485" E
7	23° 39' 56.295" N	87° 24' 37.475" E
8	23° 39' 57.251" N	87° 24' 38.029" E
9	23° 39' 54.216" N	87° 24' 39.847" E
10	23° 39' 52.235" N	87° 24' 38.987" E
11	23° 39' 51.498" N	87° 24' 38.666" E
12	23° 39' 51.329" N	87° 24' 38.593" E
13	23° 39' 48.095" N	87° 24' 37.321" E
14	23° 39' 47.051" N	87° 24' 36.776" E
15	23° 39' 47.048" N	87° 24' 36.774" E
16	23° 39' 46.340" N	87° 24' 36.404" E
17	23° 39' 43.491" N	87° 24' 35.282" E
18	23° 39' 41.497" N	87° 24' 34.497" E
19	23° 39' 40.643" N	87° 24' 34.365" E

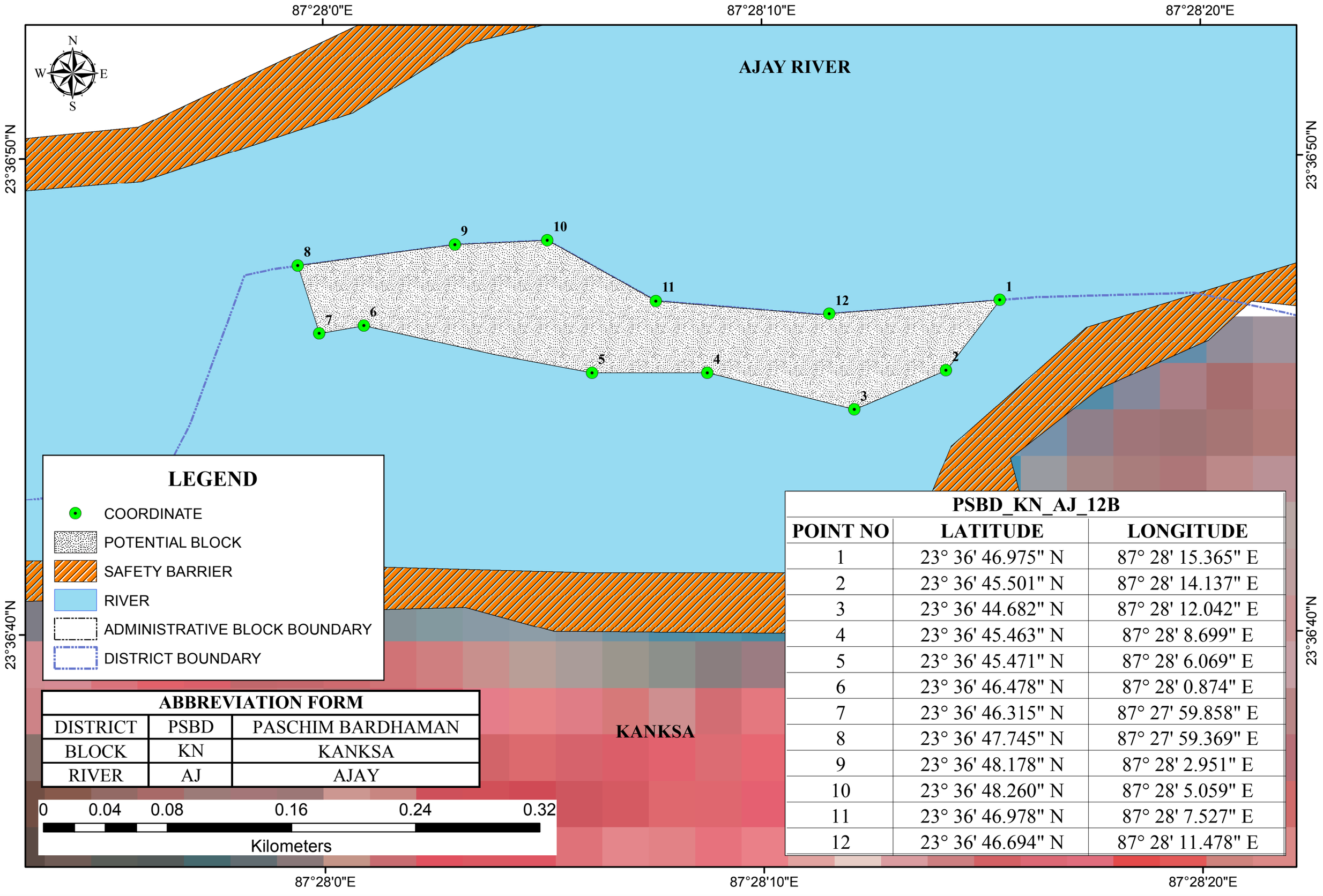
POTENTIAL BLOCK PSBD_KN_AJ_12A_I OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	KN	KANKSA
RIVER	AJ	AJAY

PSBD_KN_AJ_12A_I		
SL.NO.	LATITUDE	LONGITUDE
1	23° 36' 44.146" N	87° 27' 37.287" E
2	23° 36' 41.242" N	87° 27' 37.774" E
3	23° 36' 38.887" N	87° 27' 27.068" E
4	23° 36' 37.688" N	87° 27' 23.720" E
5	23° 36' 38.509" N	87° 27' 18.420" E
6	23° 36' 37.810" N	87° 27' 13.406" E
7	23° 36' 38.762" N	87° 27' 10.822" E
8	23° 36' 39.036" N	87° 27' 8.718" E
9	23° 36' 39.089" N	87° 27' 8.562" E
10	23° 36' 41.247" N	87° 27' 5.044" E
11	23° 36' 44.144" N	87° 27' 1.222" E
12	23° 36' 43.687" N	87° 27' 2.836" E
13	23° 36' 42.797" N	87° 27' 5.977" E
14	23° 36' 41.950" N	87° 27' 10.245" E
15	23° 36' 41.721" N	87° 27' 13.614" E
16	23° 36' 41.720" N	87° 27' 14.964" E
17	23° 36' 41.720" N	87° 27' 15.203" E
18	23° 36' 41.719" N	87° 27' 17.371" E
19	23° 36' 41.715" N	87° 27' 17.419" E
20	23° 36' 41.473" N	87° 27' 20.863" E
21	23° 36' 41.439" N	87° 27' 23.085" E
22	23° 36' 41.454" N	87° 27' 23.240" E
23	23° 36' 41.746" N	87° 27' 26.295" E
24	23° 36' 42.834" N	87° 27' 29.312" E
25	23° 36' 43.011" N	87° 27' 31.482" E
26	23° 36' 43.565" N	87° 27' 34.232" E
27	23° 36' 43.952" N	87° 27' 36.156" E
28	23° 36' 44.143" N	87° 27' 37.267" E

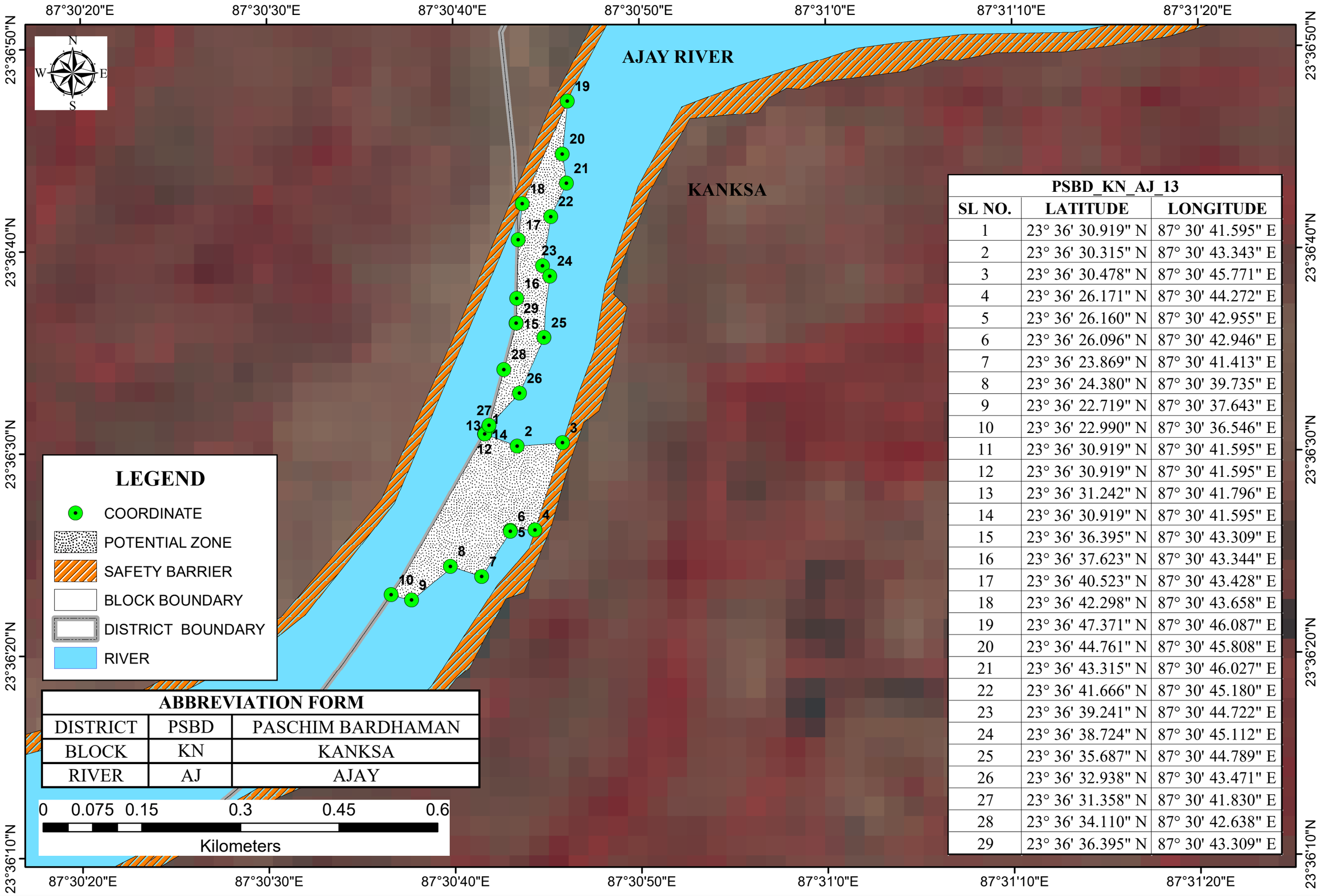
POTENTIAL BLOCK PSBD_KN_AJ_12B OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	KN	KANKSA
RIVER	AJ	AJAY

PSBD_KN_AJ_12B		
POINT NO	LATITUDE	LONGITUDE
1	23° 36' 46.975" N	87° 28' 15.365" E
2	23° 36' 45.501" N	87° 28' 14.137" E
3	23° 36' 44.682" N	87° 28' 12.042" E
4	23° 36' 45.463" N	87° 28' 8.699" E
5	23° 36' 45.471" N	87° 28' 6.069" E
6	23° 36' 46.478" N	87° 28' 0.874" E
7	23° 36' 46.315" N	87° 27' 59.858" E
8	23° 36' 47.745" N	87° 27' 59.369" E
9	23° 36' 48.178" N	87° 28' 2.951" E
10	23° 36' 48.260" N	87° 28' 5.059" E
11	23° 36' 46.978" N	87° 28' 7.527" E
12	23° 36' 46.694" N	87° 28' 11.478" E

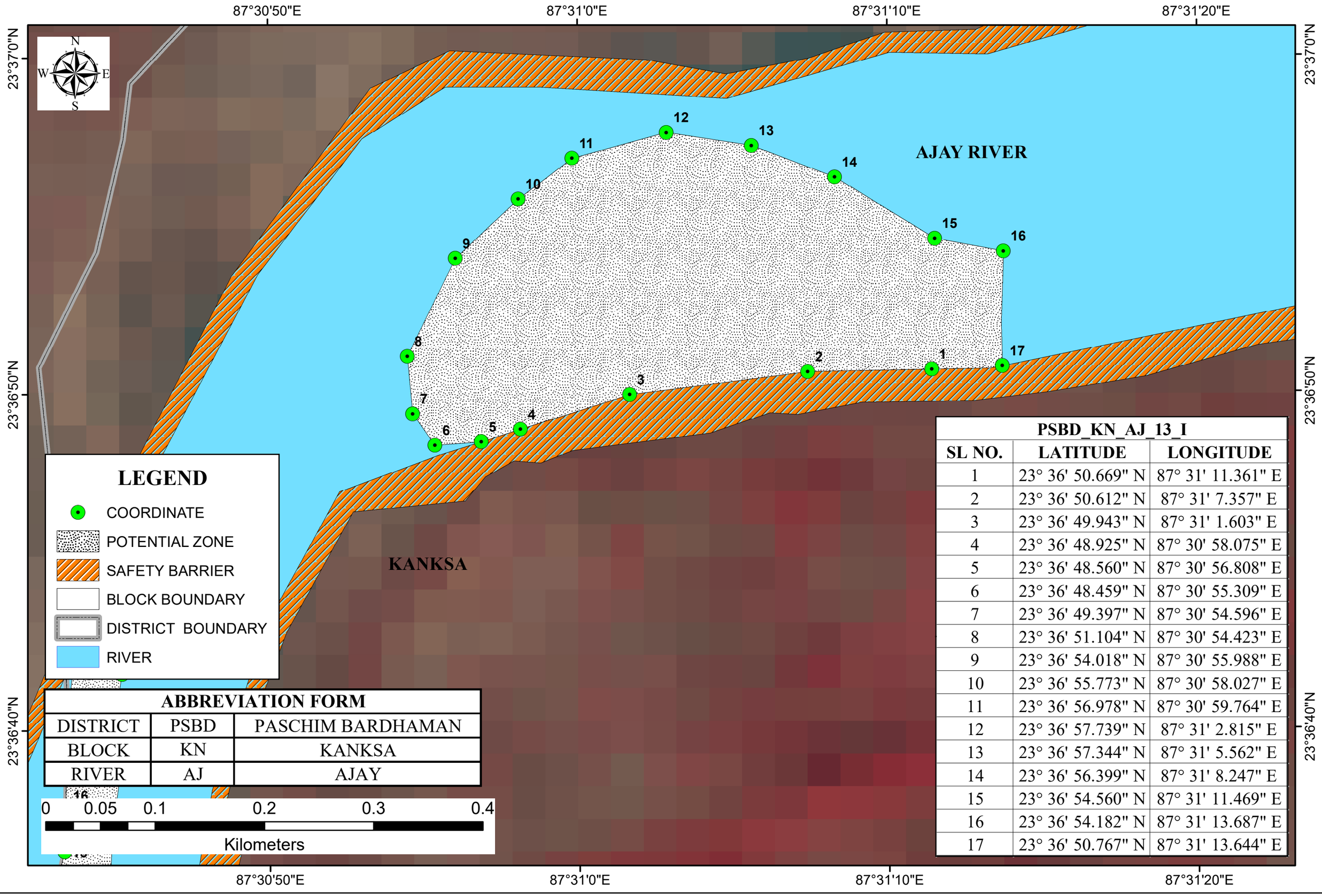
POTENTIAL BLOCK PSBD_KN_AJ_13 OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	KN	KANKSA
RIVER	AJ	AJAY

PSBD_KN_AJ_13		
SL NO.	LATITUDE	LONGITUDE
1	23° 36' 30.919" N	87° 30' 41.595" E
2	23° 36' 30.315" N	87° 30' 43.343" E
3	23° 36' 30.478" N	87° 30' 45.771" E
4	23° 36' 26.171" N	87° 30' 44.272" E
5	23° 36' 26.160" N	87° 30' 42.955" E
6	23° 36' 26.096" N	87° 30' 42.946" E
7	23° 36' 23.869" N	87° 30' 41.413" E
8	23° 36' 24.380" N	87° 30' 39.735" E
9	23° 36' 22.719" N	87° 30' 37.643" E
10	23° 36' 22.990" N	87° 30' 36.546" E
11	23° 36' 30.919" N	87° 30' 41.595" E
12	23° 36' 30.919" N	87° 30' 41.595" E
13	23° 36' 31.242" N	87° 30' 41.796" E
14	23° 36' 30.919" N	87° 30' 41.595" E
15	23° 36' 36.395" N	87° 30' 43.309" E
16	23° 36' 37.623" N	87° 30' 43.344" E
17	23° 36' 40.523" N	87° 30' 43.428" E
18	23° 36' 42.298" N	87° 30' 43.658" E
19	23° 36' 47.371" N	87° 30' 46.087" E
20	23° 36' 44.761" N	87° 30' 45.808" E
21	23° 36' 43.315" N	87° 30' 46.027" E
22	23° 36' 41.666" N	87° 30' 45.180" E
23	23° 36' 39.241" N	87° 30' 44.722" E
24	23° 36' 38.724" N	87° 30' 45.112" E
25	23° 36' 35.687" N	87° 30' 44.789" E
26	23° 36' 32.938" N	87° 30' 43.471" E
27	23° 36' 31.358" N	87° 30' 41.830" E
28	23° 36' 34.110" N	87° 30' 42.638" E
29	23° 36' 36.395" N	87° 30' 43.309" E

POTENTIAL BLOCK PSBD_KN_AJ_13_I OF AJAY RIVER



ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	KN	KANKSA
RIVER	AJ	AJAY

PSBD_KN_AJ_13_I		
SL NO.	LATITUDE	LONGITUDE
1	23° 36' 50.669" N	87° 31' 11.361" E
2	23° 36' 50.612" N	87° 31' 7.357" E
3	23° 36' 49.943" N	87° 31' 1.603" E
4	23° 36' 48.925" N	87° 30' 58.075" E
5	23° 36' 48.560" N	87° 30' 56.808" E
6	23° 36' 48.459" N	87° 30' 55.309" E
7	23° 36' 49.397" N	87° 30' 54.596" E
8	23° 36' 51.104" N	87° 30' 54.423" E
9	23° 36' 54.018" N	87° 30' 55.988" E
10	23° 36' 55.773" N	87° 30' 58.027" E
11	23° 36' 56.978" N	87° 30' 59.764" E
12	23° 36' 57.739" N	87° 31' 2.815" E
13	23° 36' 57.344" N	87° 31' 5.562" E
14	23° 36' 56.399" N	87° 31' 8.247" E
15	23° 36' 54.560" N	87° 31' 11.469" E
16	23° 36' 54.182" N	87° 31' 13.687" E
17	23° 36' 50.767" N	87° 31' 13.644" E

POTENTIAL BLOCK PSBD_AN_DA_01 ON DAMODAR RIVER

RANIGANJ

ANDAL

DAMODAR RIVER

LEGEND

- COORDINATE
- DISTRICT BOUNDARY
- POTENTIAL ZONE
- SAFETY BARRIER
- BLOCK BOUNDARY
- RIVER

ABBREVIATION FORM		
DISTRICT	PSBD	PASCHIM BARDHAMAN
BLOCK	AN	ANDAL
RIVER	DA	DAMODAR

0 0.225 0.45 0.9 1.35 1.8

Kilometers

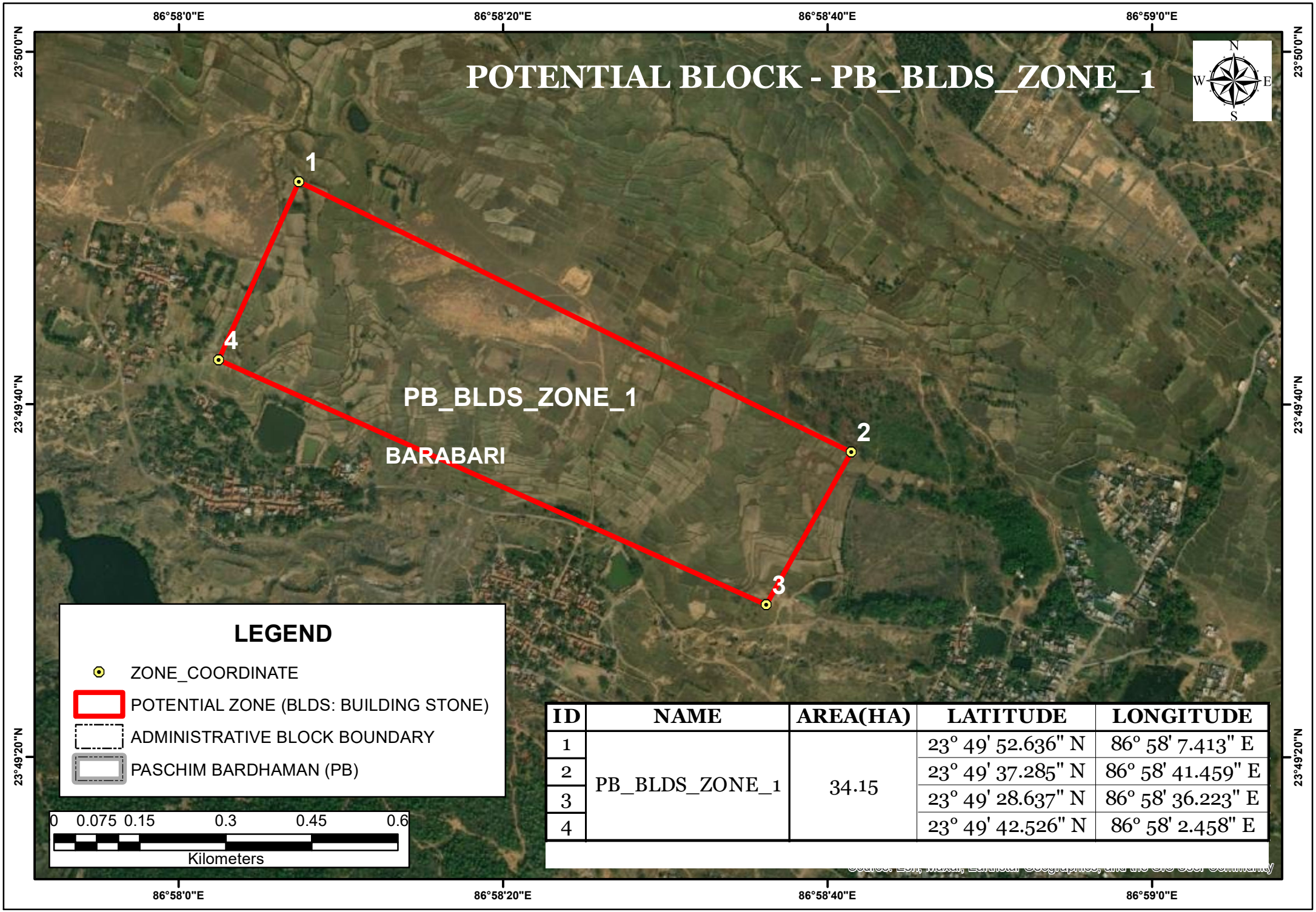
PSBD_AN_DA_01		
SL NO.	LATITUDE	LONGITUDE
1	23° 34' 23.911" N	87° 8' 15.487" E
2	23° 34' 23.664" N	87° 8' 22.021" E
3	23° 34' 21.044" N	87° 8' 27.731" E
4	23° 34' 21.028" N	87° 8' 32.640" E
5	23° 34' 20.762" N	87° 8' 38.791" E
6	23° 34' 20.513" N	87° 8' 47.229" E
7	23° 34' 18.649" N	87° 8' 53.350" E
8	23° 34' 16.685" N	87° 8' 55.700" E
9	23° 34' 14.476" N	87° 9' 1.970" E
10	23° 34' 12.235" N	87° 9' 6.261" E
11	23° 34' 8.927" N	87° 9' 10.327" E
12	23° 34' 3.799" N	87° 9' 19.750" E
13	23° 33' 51.526" N	87° 9' 57.373" E
14	23° 33' 51.115" N	87° 10' 9.759" E
15	23° 33' 46.442" N	87° 10' 4.977" E
16	23° 33' 43.763" N	87° 9' 55.640" E
17	23° 33' 47.556" N	87° 9' 27.644" E
18	23° 33' 57.049" N	87° 8' 58.138" E
19	23° 34' 2.798" N	87° 8' 52.449" E
20	23° 34' 5.074" N	87° 8' 48.195" E
21	23° 34' 7.022" N	87° 8' 27.344" E
22	23° 34' 6.555" N	87° 8' 24.970" E
23	23° 34' 8.055" N	87° 8' 19.508" E
24	23° 34' 27.927" N	87° 7' 53.770" E

87°7'40"E 87°7'50"E 87°8'0"E 87°8'10"E 87°8'20"E 87°8'30"E 87°8'40"E 87°8'50"E 87°9'0"E 87°9'10"E 87°9'20"E 87°9'30"E 87°9'40"E 87°9'50"E 87°10'0"E 87°10'10"E

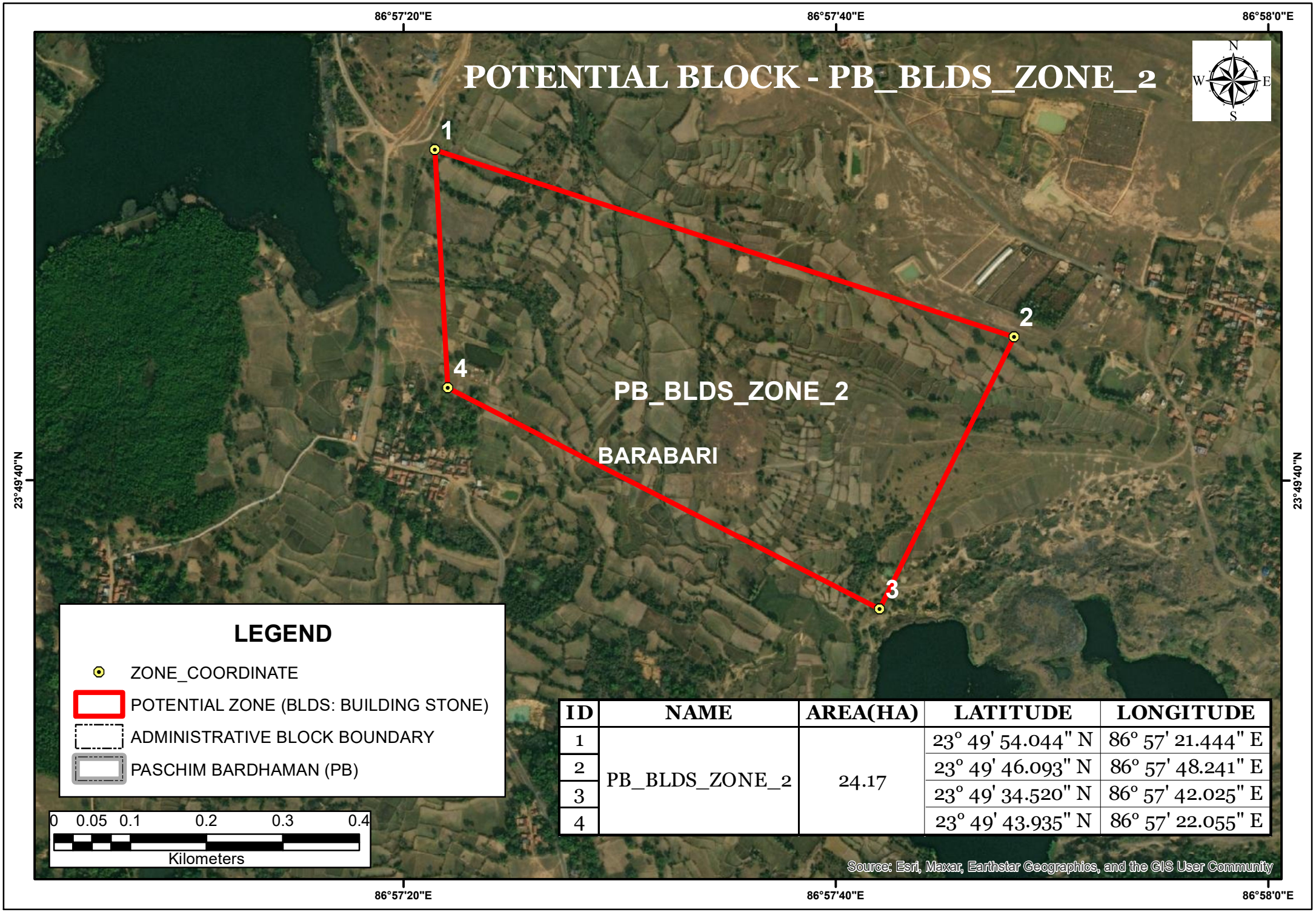
23°34'30"N 23°34'20"N 23°34'10"N 23°34'0"N 23°33'50"N 23°33'40"N 23°33'30"N 23°33'20"N 23°33'10"N 23°33'0"N

Annexure 5
Map showing of Potential In-situ mineral Blocks of Paschim Bardhaman District

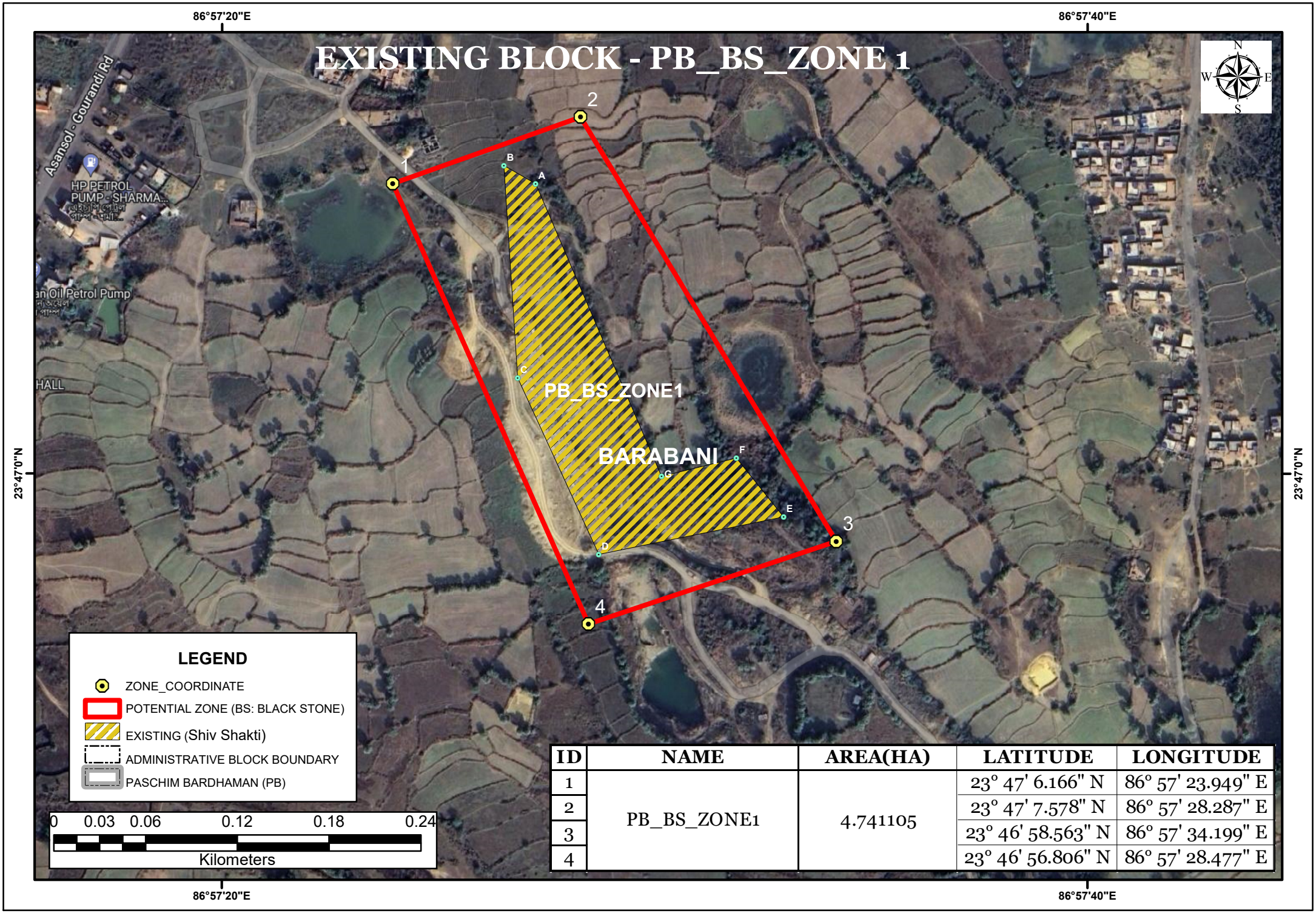
POTENTIAL BLOCK - PB_BLDS_ZONE_1



ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_BLDS_ZONE_1	34.15	23° 49' 52.636" N	86° 58' 7.413" E
2			23° 49' 37.285" N	86° 58' 41.459" E
3			23° 49' 28.637" N	86° 58' 36.223" E
4			23° 49' 42.526" N	86° 58' 2.458" E



ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_BLDS_ZONE_2	24.17	23° 49' 54.044" N	86° 57' 21.444" E
2			23° 49' 46.093" N	86° 57' 48.241" E
3			23° 49' 34.520" N	86° 57' 42.025" E
4			23° 49' 43.935" N	86° 57' 22.055" E

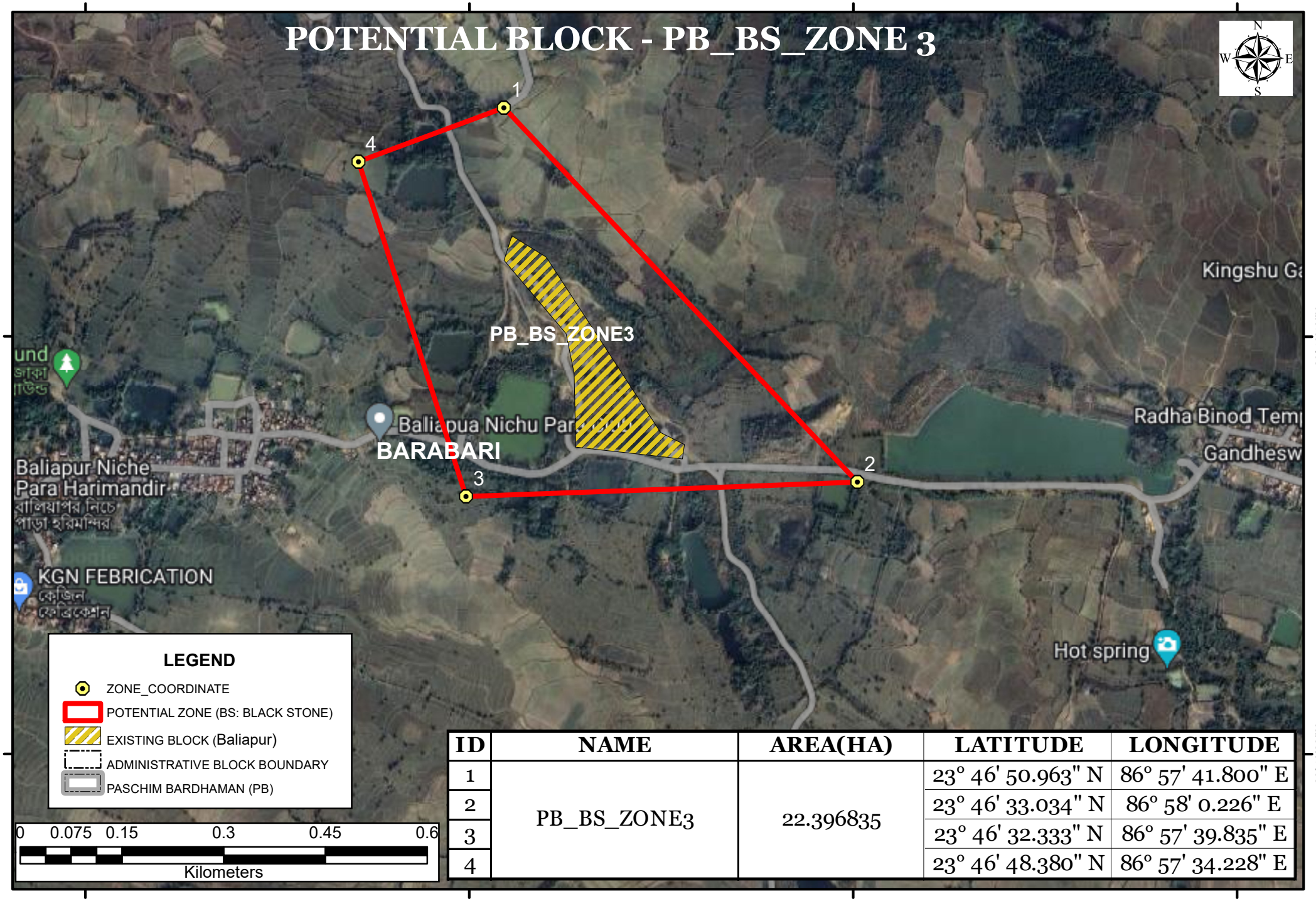


ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_BS_ZONE1	4.741105	23° 47' 6.166" N	86° 57' 23.949" E
2			23° 47' 7.578" N	86° 57' 28.287" E
3			23° 46' 58.563" N	86° 57' 34.199" E
4			23° 46' 56.806" N	86° 57' 28.477" E

EXISTING BLOCK - PB_BS_ZONE 2

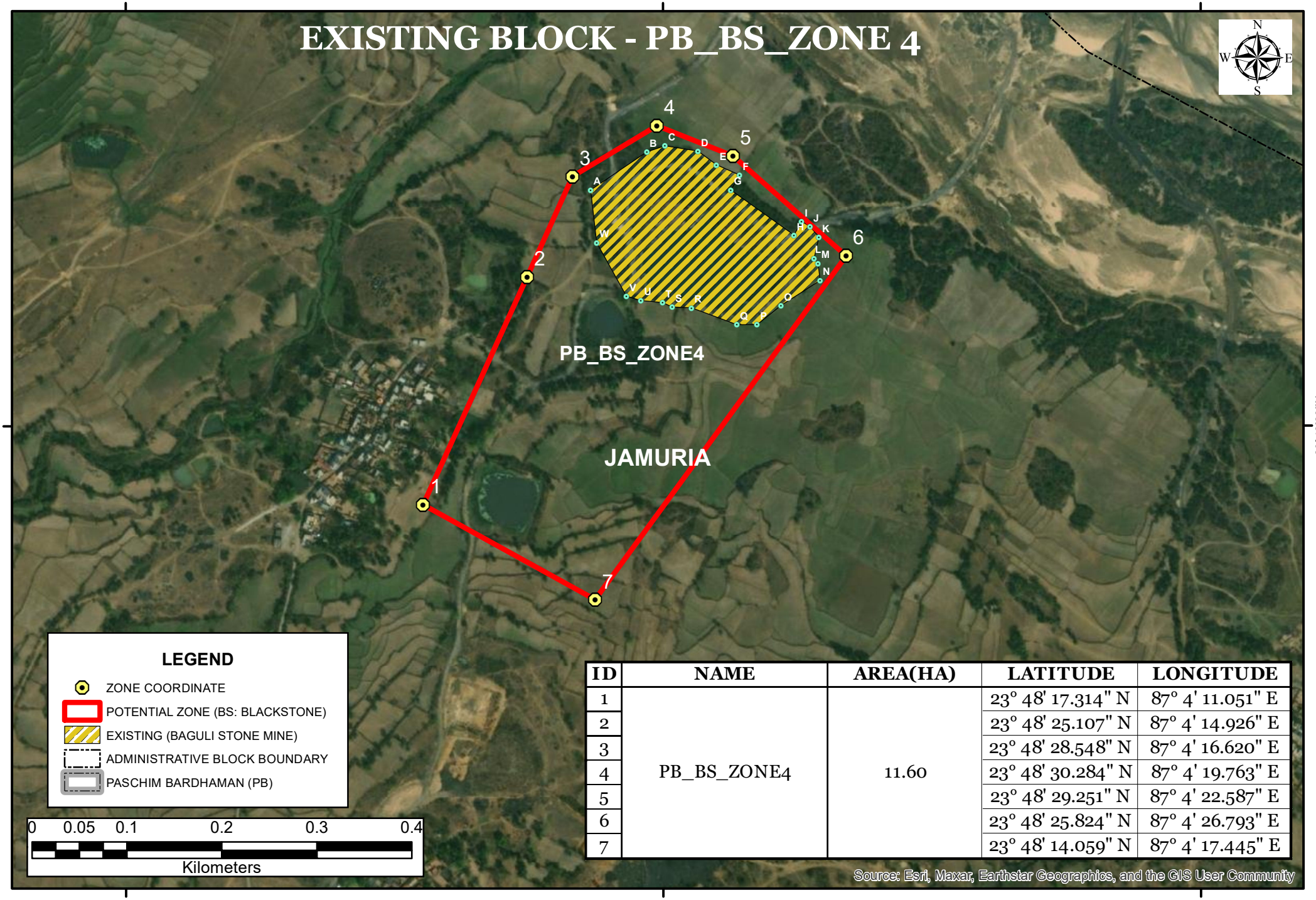
ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_BS_ZONE2	3.023024	23° 47' 30.837" N	86° 57' 21.626" E
2			23° 47' 31.285" N	86° 57' 25.459" E
3			23° 47' 23.422" N	86° 57' 26.397" E
4			23° 47' 22.560" N	86° 57' 21.703" E

POTENTIAL BLOCK - PB_BS_ZONE 3



ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_BS_ZONE3	22.396835	23° 46' 50.963" N	86° 57' 41.800" E
2			23° 46' 33.034" N	86° 58' 0.226" E
3			23° 46' 32.333" N	86° 57' 39.835" E
4			23° 46' 48.380" N	86° 57' 34.228" E

EXISTING BLOCK - PB_BS_ZONE 4



ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_BS_ZONE4	11.60	23° 48' 17.314" N	87° 4' 11.051" E
2			23° 48' 25.107" N	87° 4' 14.926" E
3			23° 48' 28.548" N	87° 4' 16.620" E
4			23° 48' 30.284" N	87° 4' 19.763" E
5			23° 48' 29.251" N	87° 4' 22.587" E
6			23° 48' 25.824" N	87° 4' 26.793" E
7			23° 48' 14.059" N	87° 4' 17.445" E

POTENTIAL ZONE - PB_BS_ZONE_5

86°55'30"E 86°56'0"E 86°56'30"E 86°57'0"E 86°57'30"E 86°58'0"E 86°58'30"E 86°59'0"E 86°59'30"E

23°50'30"N 23°50'0"N 23°49'30"N 23°49'0"N 23°48'30"N 23°48'0"N

N W E S

1 2 3 4 5 6

PB_BS_ZONE_5

SALANPUR

BARABANI

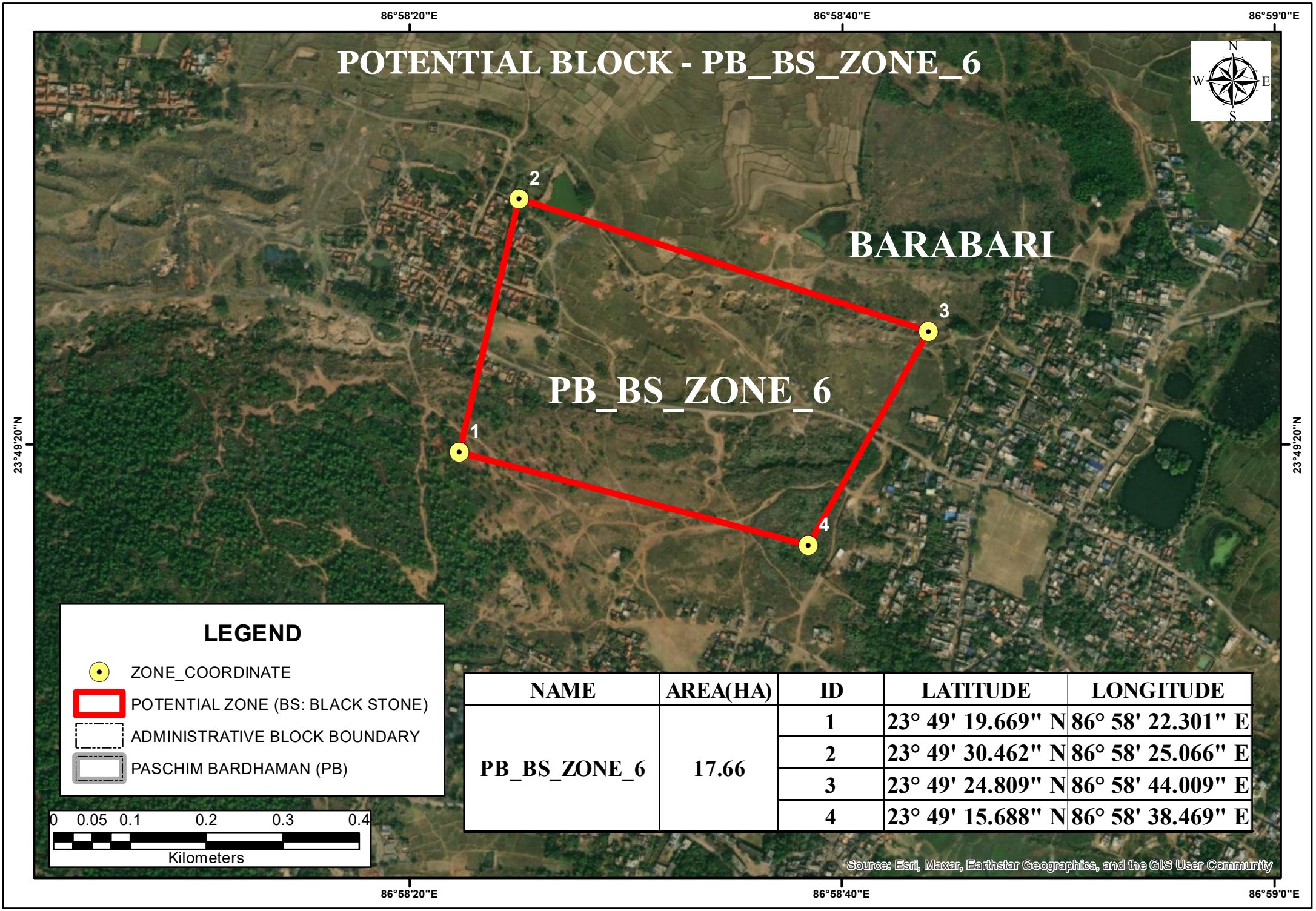
LEGEND

- ZONE COORDINATE
- POTENTIAL ZONE (BS : BLACK STONE)
- ADMINISTRATIVE BLOCK BOUNDARY
- PASCHIM BARDHAMAN (PB)

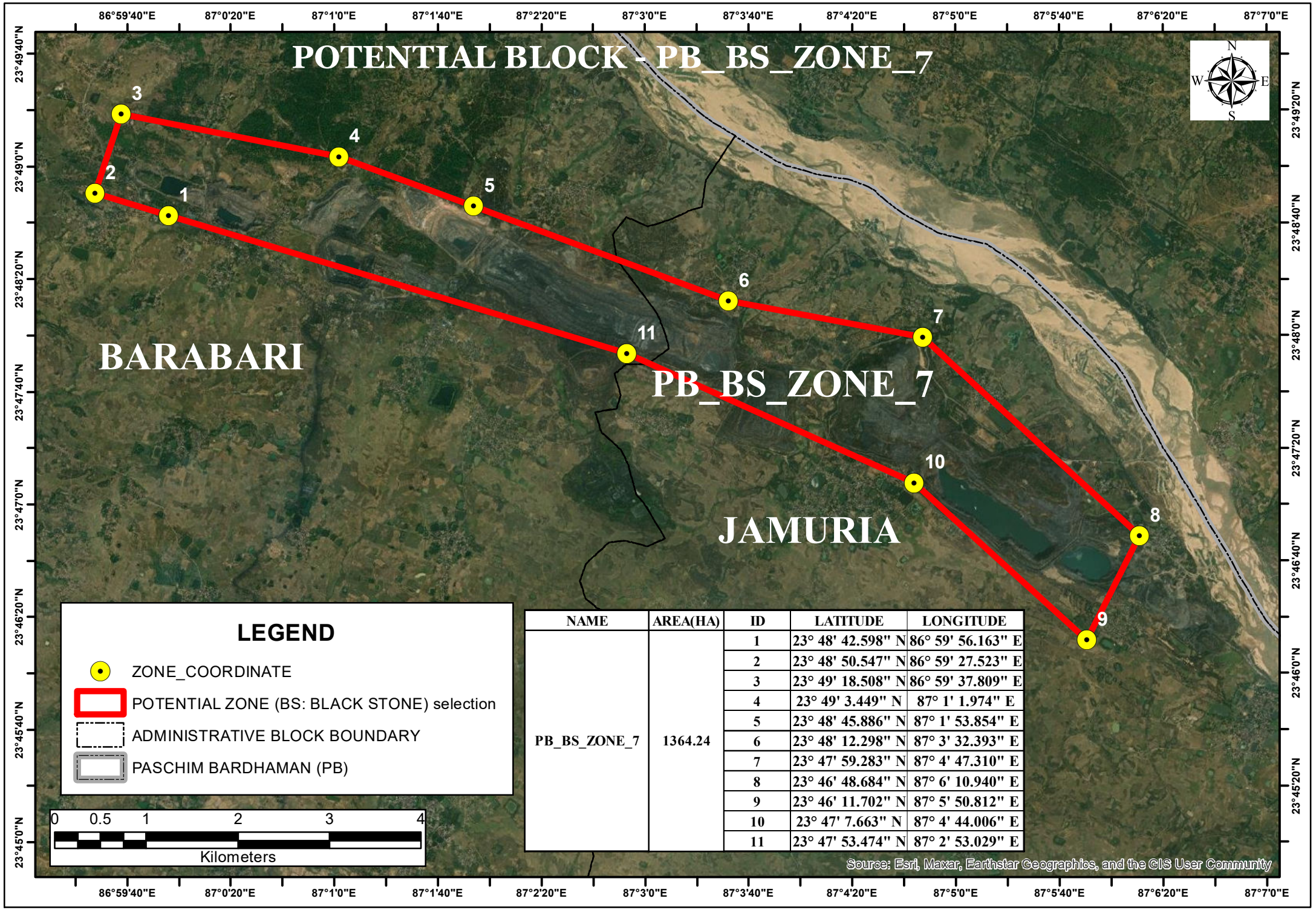
0 0.35 0.7 1.4 2.1 2.8

Kilometers

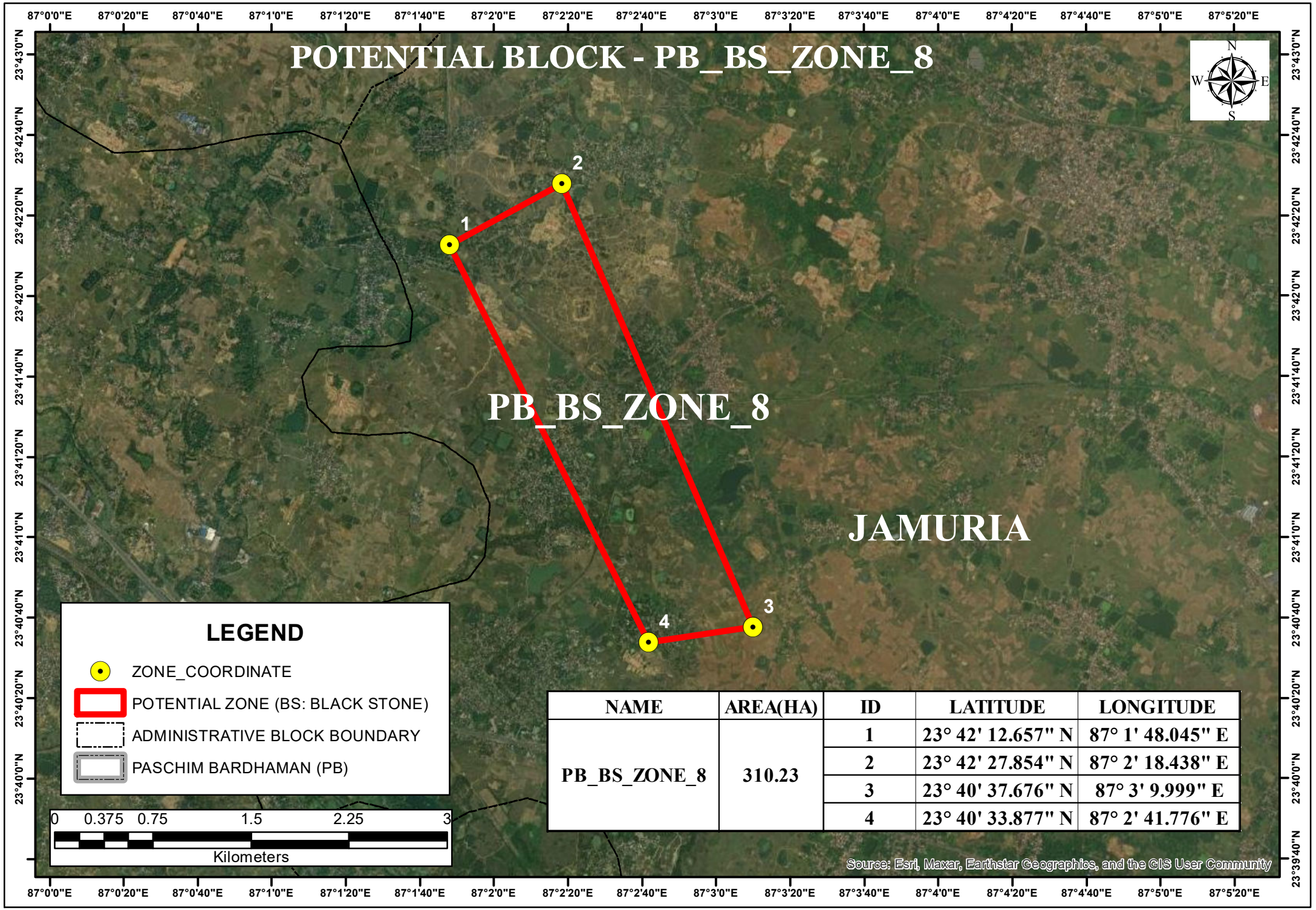
NAME	AREA (HA)	POINT ID	LATITUDE	LONGITUDE
PB_BS_ZONE5	308.226075	1	23° 50' 21.145" N	86° 56' 19.394" E
		2	23° 50' 25.105" N	86° 56' 40.604" E
		3	23° 49' 19.850" N	86° 57' 9.078" E
		4	23° 47' 56.794" N	86° 57' 28.197" E
		5	23° 47' 50.009" N	86° 57' 8.872" E
		6	23° 49' 57.491" N	86° 56' 31.272" E



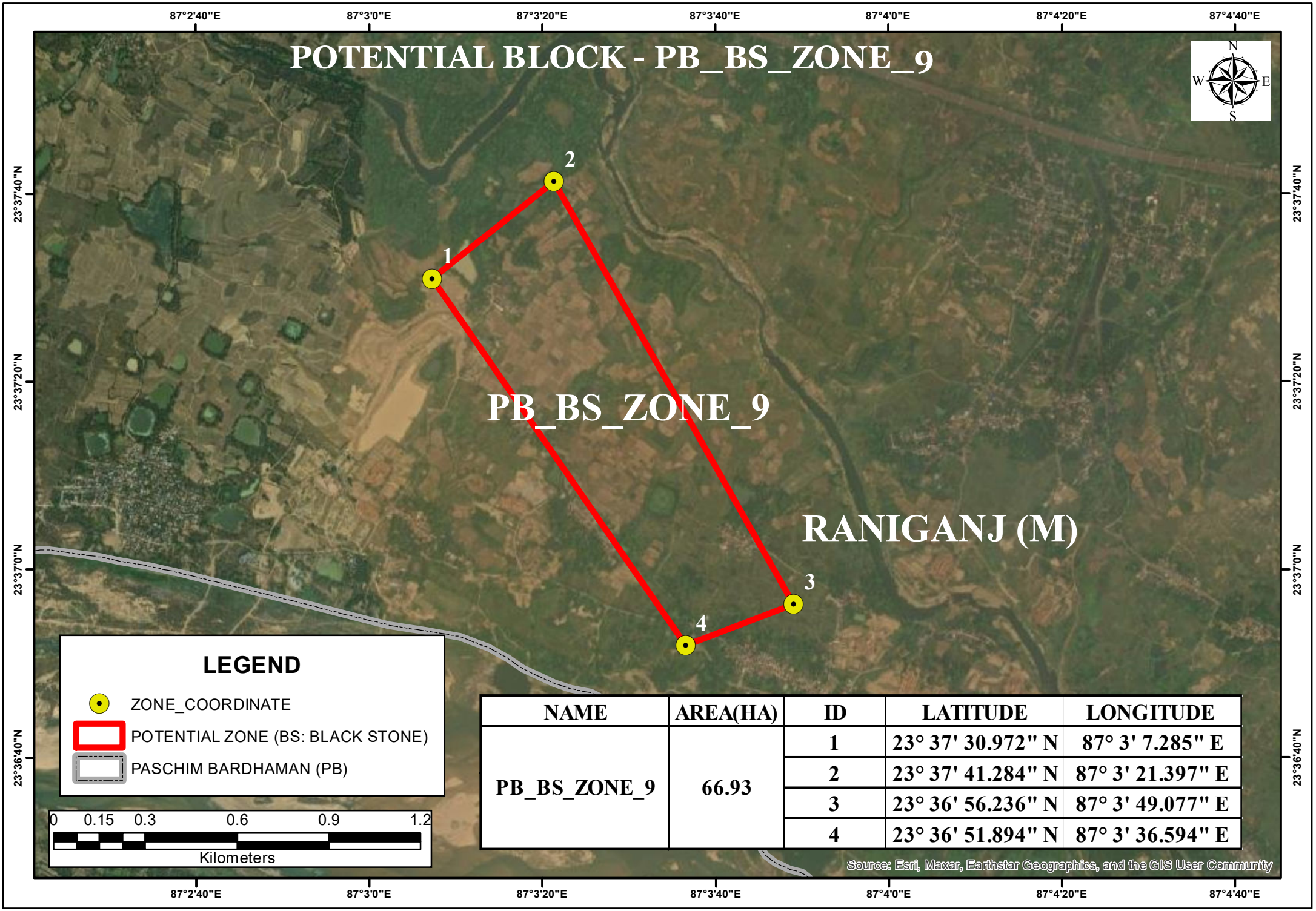
NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_6	17.66	1	23° 49' 19.669" N	86° 58' 22.301" E
		2	23° 49' 30.462" N	86° 58' 25.066" E
		3	23° 49' 24.809" N	86° 58' 44.009" E
		4	23° 49' 15.688" N	86° 58' 38.469" E



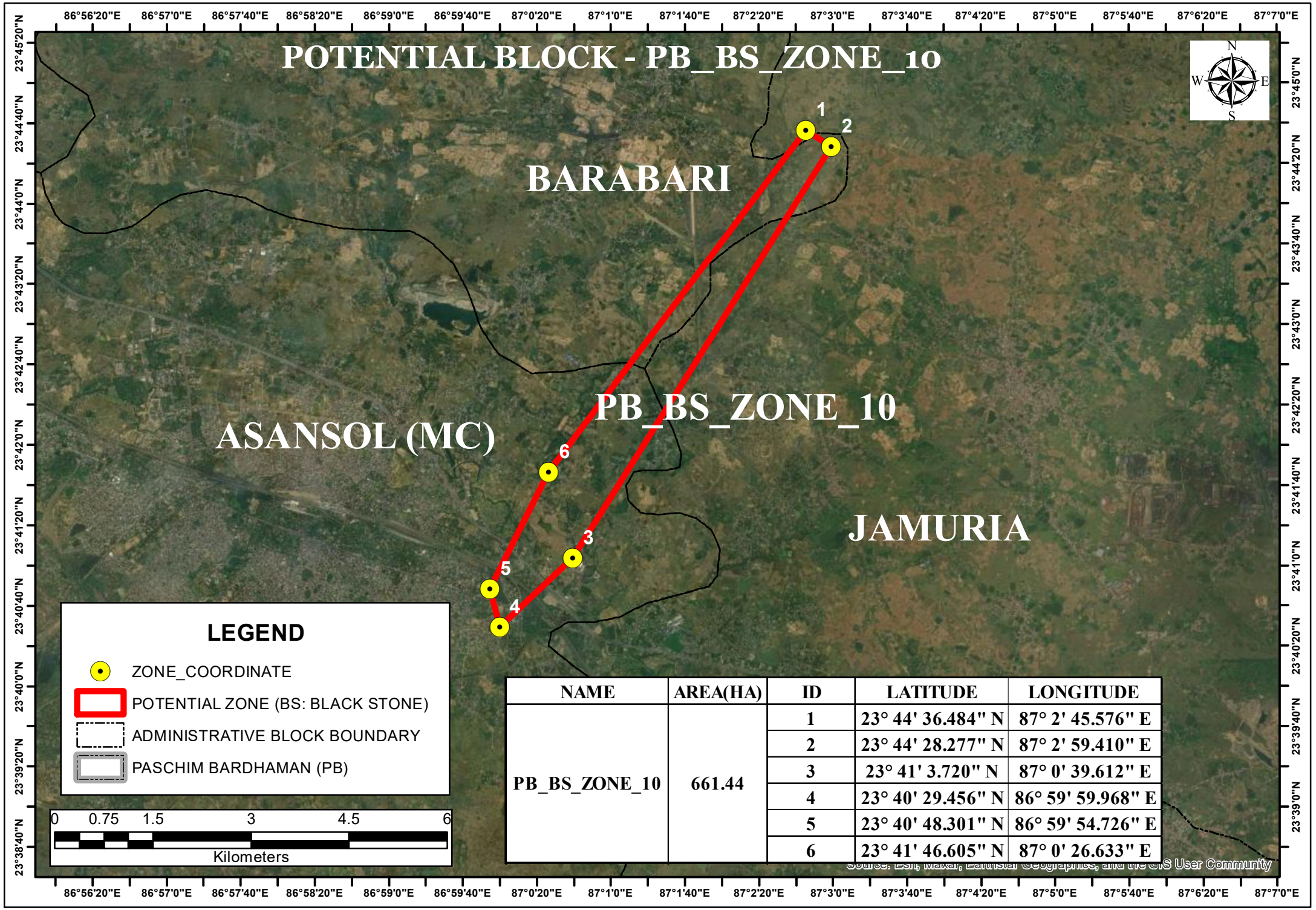
NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_7	1364.24	1	23° 48' 42.598" N	86° 59' 56.163" E
		2	23° 48' 50.547" N	86° 59' 27.523" E
		3	23° 49' 18.508" N	86° 59' 37.809" E
		4	23° 49' 3.449" N	87° 1' 1.974" E
		5	23° 48' 45.886" N	87° 1' 53.854" E
		6	23° 48' 12.298" N	87° 3' 32.393" E
		7	23° 47' 59.283" N	87° 4' 47.310" E
		8	23° 46' 48.684" N	87° 6' 10.940" E
		9	23° 46' 11.702" N	87° 5' 50.812" E
		10	23° 47' 7.663" N	87° 4' 44.006" E
		11	23° 47' 53.474" N	87° 2' 53.029" E



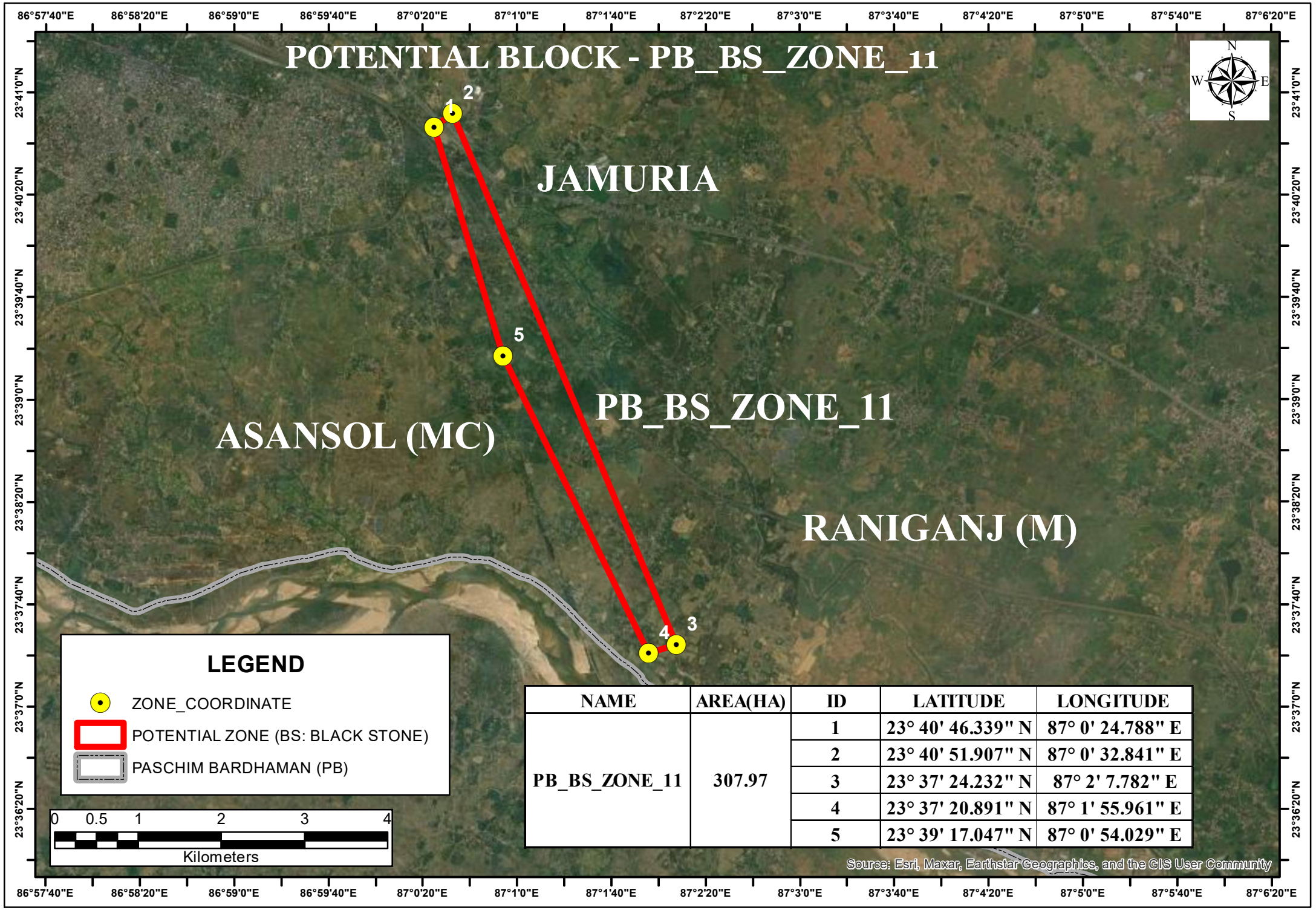
NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_8	310.23	1	23° 42' 12.657" N	87° 1' 48.045" E
		2	23° 42' 27.854" N	87° 2' 18.438" E
		3	23° 40' 37.676" N	87° 3' 9.999" E
		4	23° 40' 33.877" N	87° 2' 41.776" E



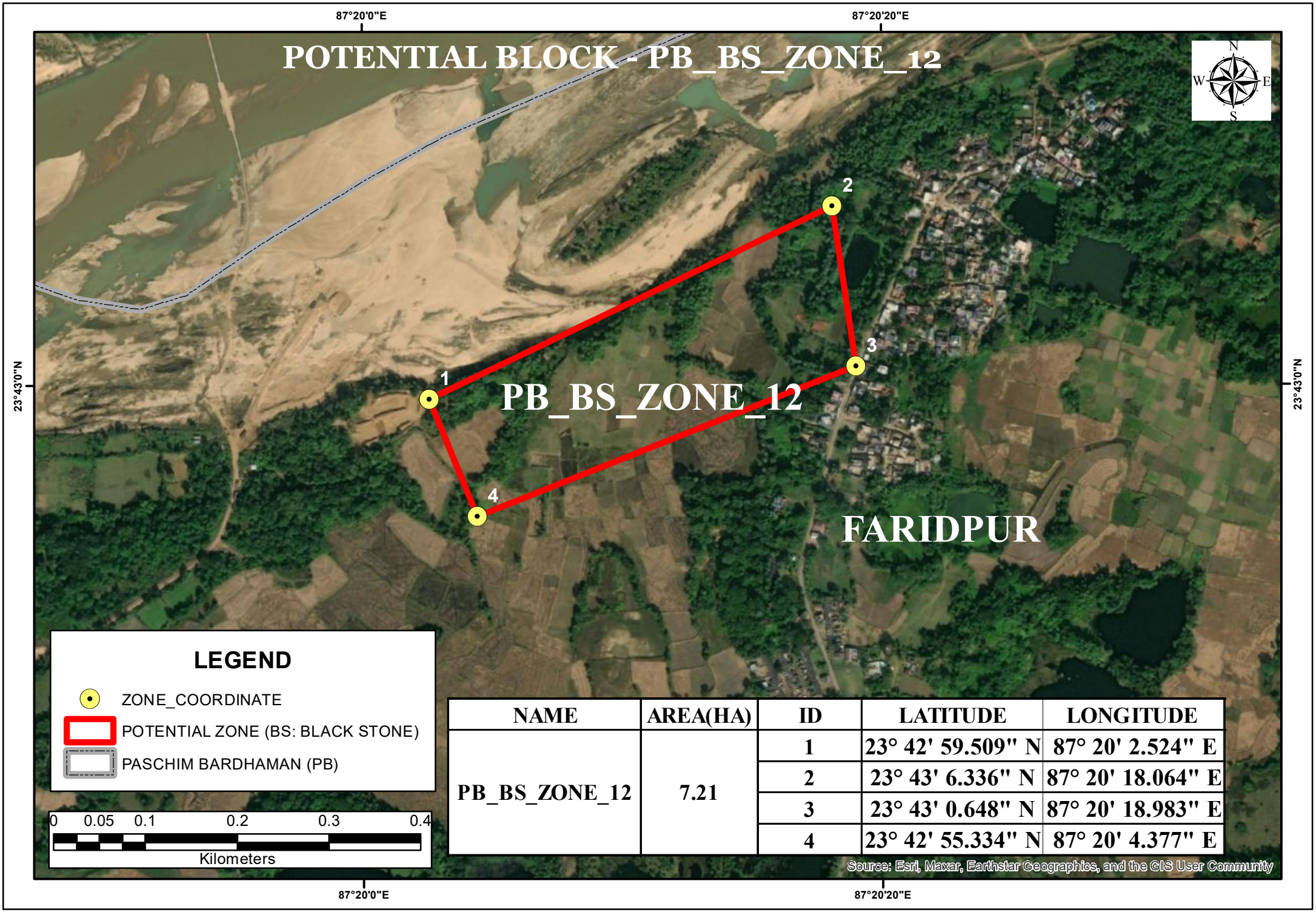
NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_9	66.93	1	23° 37' 30.972" N	87° 3' 7.285" E
		2	23° 37' 41.284" N	87° 3' 21.397" E
		3	23° 36' 56.236" N	87° 3' 49.077" E
		4	23° 36' 51.894" N	87° 3' 36.594" E



NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_10	661.44	1	23° 44' 36.484" N	87° 2' 45.576" E
		2	23° 44' 28.277" N	87° 2' 59.410" E
		3	23° 41' 3.720" N	87° 0' 39.612" E
		4	23° 40' 29.456" N	86° 59' 59.968" E
		5	23° 40' 48.301" N	86° 59' 54.726" E
		6	23° 41' 46.605" N	87° 0' 26.633" E

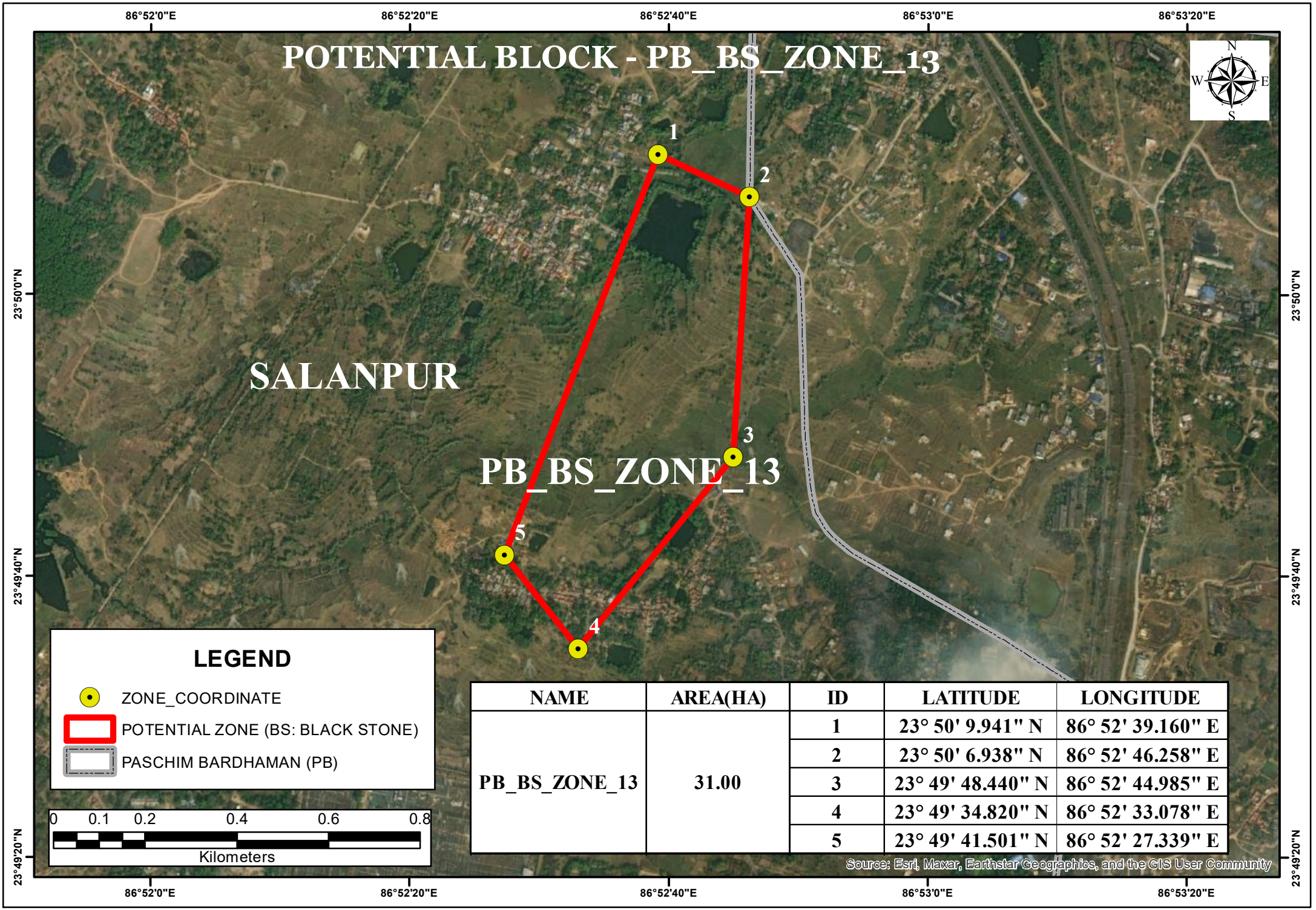


NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_11	307.97	1	23° 40' 46.339" N	87° 0' 24.788" E
		2	23° 40' 51.907" N	87° 0' 32.841" E
		3	23° 37' 24.232" N	87° 2' 7.782" E
		4	23° 37' 20.891" N	87° 1' 55.961" E
		5	23° 39' 17.047" N	87° 0' 54.029" E

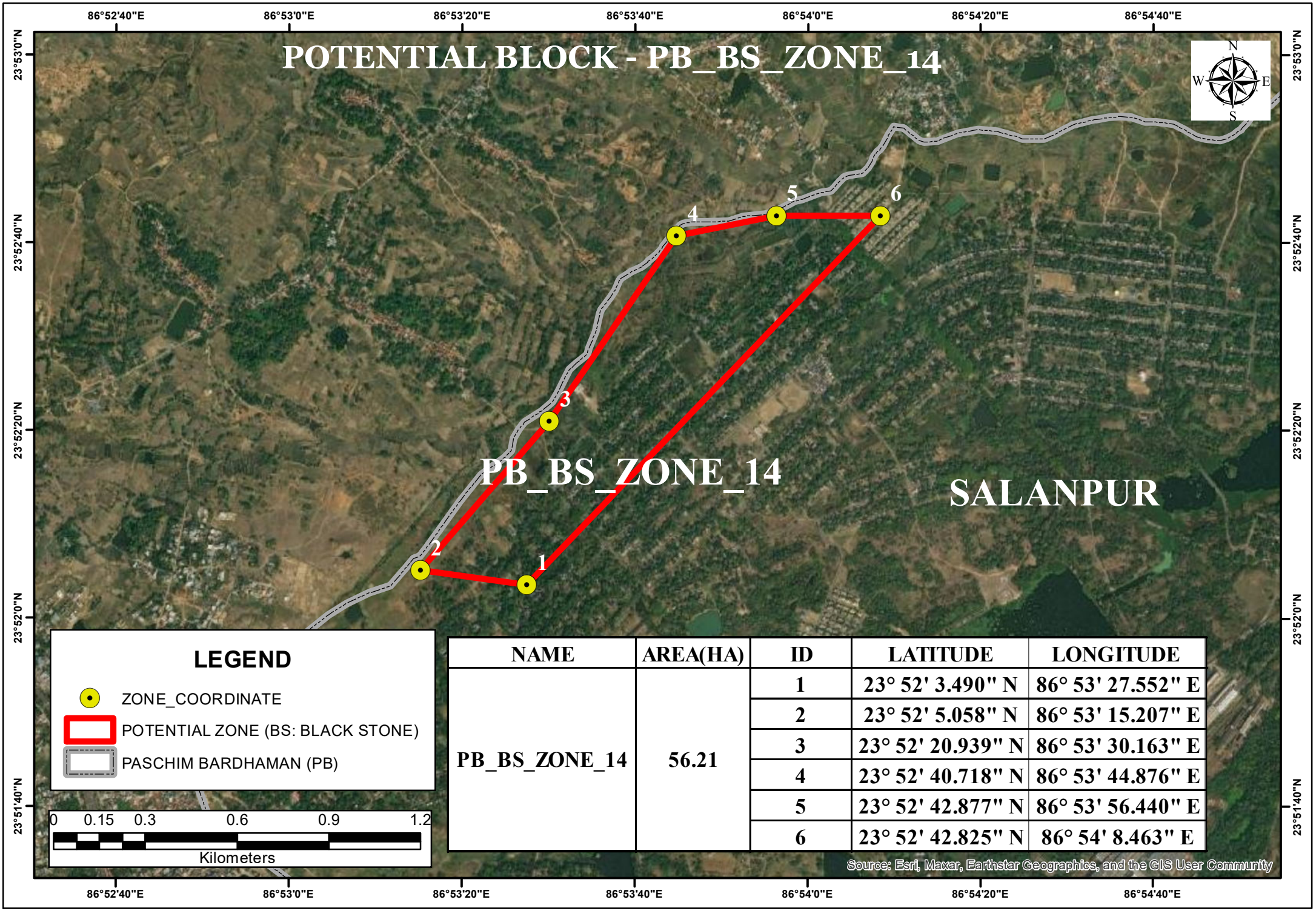


NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_12	7.21	1	23° 42' 59.509" N	87° 20' 2.524" E
		2	23° 43' 6.336" N	87° 20' 18.064" E
		3	23° 43' 0.648" N	87° 20' 18.983" E
		4	23° 42' 55.334" N	87° 20' 4.377" E

POTENTIAL BLOCK - PB_BS_ZONE_13

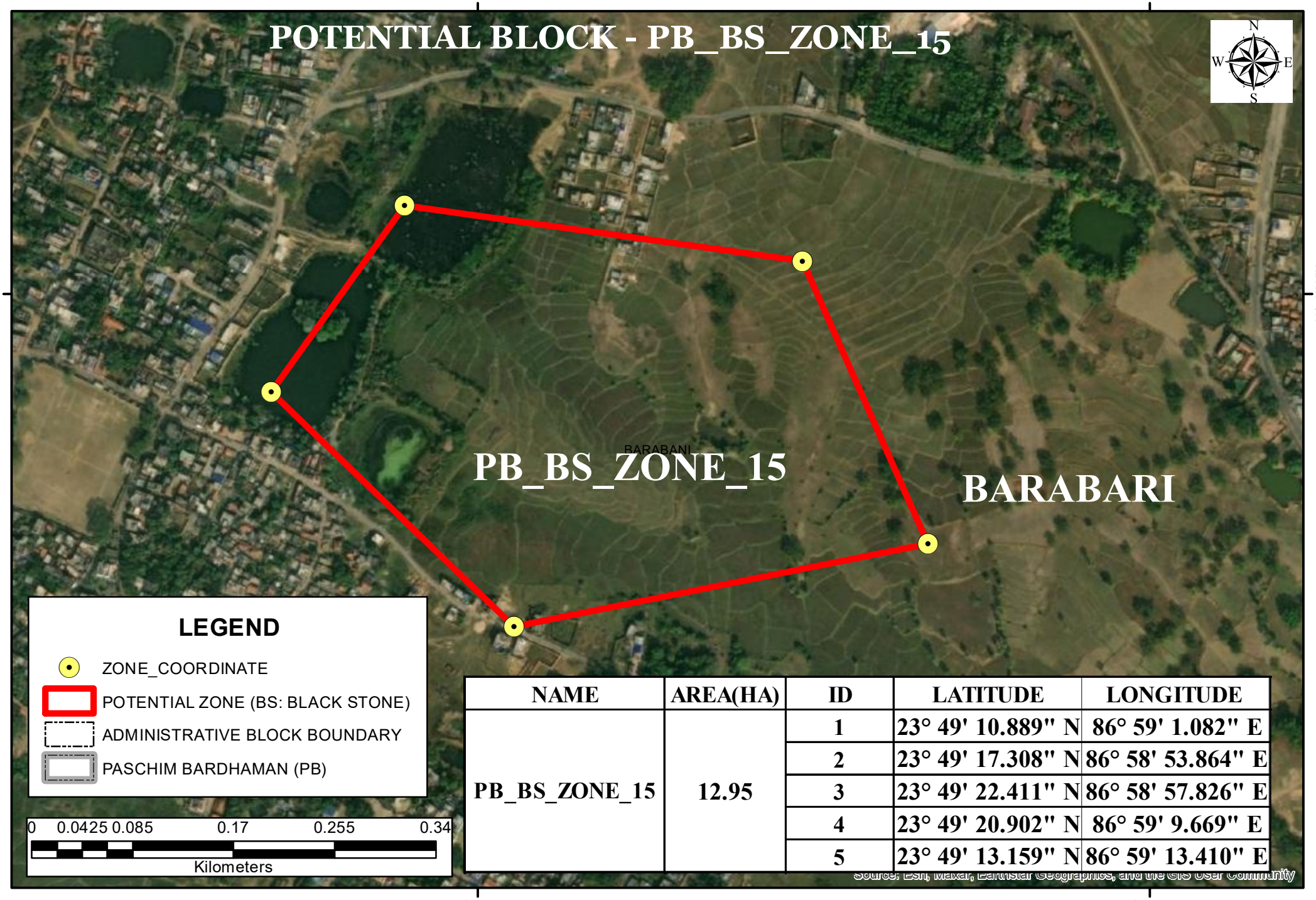


NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_13	31.00	1	23° 50' 9.941" N	86° 52' 39.160" E
		2	23° 50' 6.938" N	86° 52' 46.258" E
		3	23° 49' 48.440" N	86° 52' 44.985" E
		4	23° 49' 34.820" N	86° 52' 33.078" E
		5	23° 49' 41.501" N	86° 52' 27.339" E



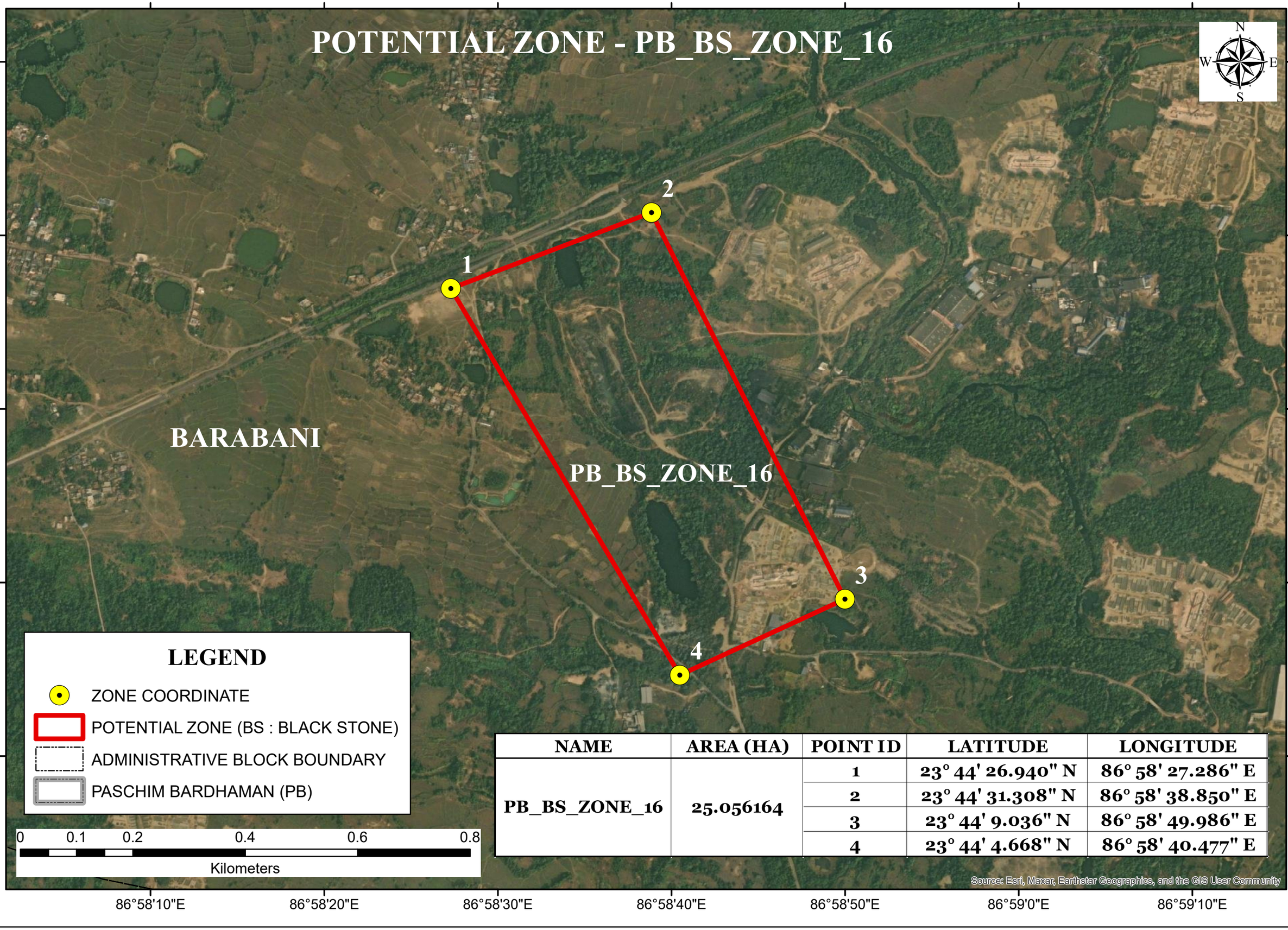
NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_14	56.21	1	23° 52' 3.490" N	86° 53' 27.552" E
		2	23° 52' 5.058" N	86° 53' 15.207" E
		3	23° 52' 20.939" N	86° 53' 30.163" E
		4	23° 52' 40.718" N	86° 53' 44.876" E
		5	23° 52' 42.877" N	86° 53' 56.440" E
		6	23° 52' 42.825" N	86° 54' 8.463" E

POTENTIAL BLOCK - PB_BS_ZONE_15



NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_BS_ZONE_15	12.95	1	23° 49' 10.889" N	86° 59' 1.082" E
		2	23° 49' 17.308" N	86° 58' 53.864" E
		3	23° 49' 22.411" N	86° 58' 57.826" E
		4	23° 49' 20.902" N	86° 59' 9.669" E
		5	23° 49' 13.159" N	86° 59' 13.410" E

POTENTIAL ZONE - PB_BS_ZONE_16



LEGEND

- ZONE COORDINATE
- POTENTIAL ZONE (BS : BLACK STONE)
- ADMINISTRATIVE BLOCK BOUNDARY
- PASCHIM BARDHAMAN (PB)

0 0.1 0.2 0.4 0.6 0.8

Kilometers

NAME	AREA (HA)	POINT ID	LATITUDE	LONGITUDE
PB_BS_ZONE_16	25.056164	1	23° 44' 26.940" N	86° 58' 27.286" E
		2	23° 44' 31.308" N	86° 58' 38.850" E
		3	23° 44' 9.036" N	86° 58' 49.986" E
		4	23° 44' 4.668" N	86° 58' 40.477" E

POTENTIAL ZONE - PB_BS_ZONE_17

86°50'0"E 86°50'10"E 86°50'20"E 86°50'30"E 86°50'40"E 86°50'50"E

23°47'30"N 23°47'20"N 23°47'10"N 23°47'0"N

SALANPUR

PB_BS_ZONE_17

1 2 3 4

N W E S

LEGEND

- ZONE COORDINATE
- POTENTIAL ZONE (BS : BLACK STONE)
- ADMINISTRATIVE BLOCK BOUNDARY
- PASCHIM BARDHAMAN (PB)

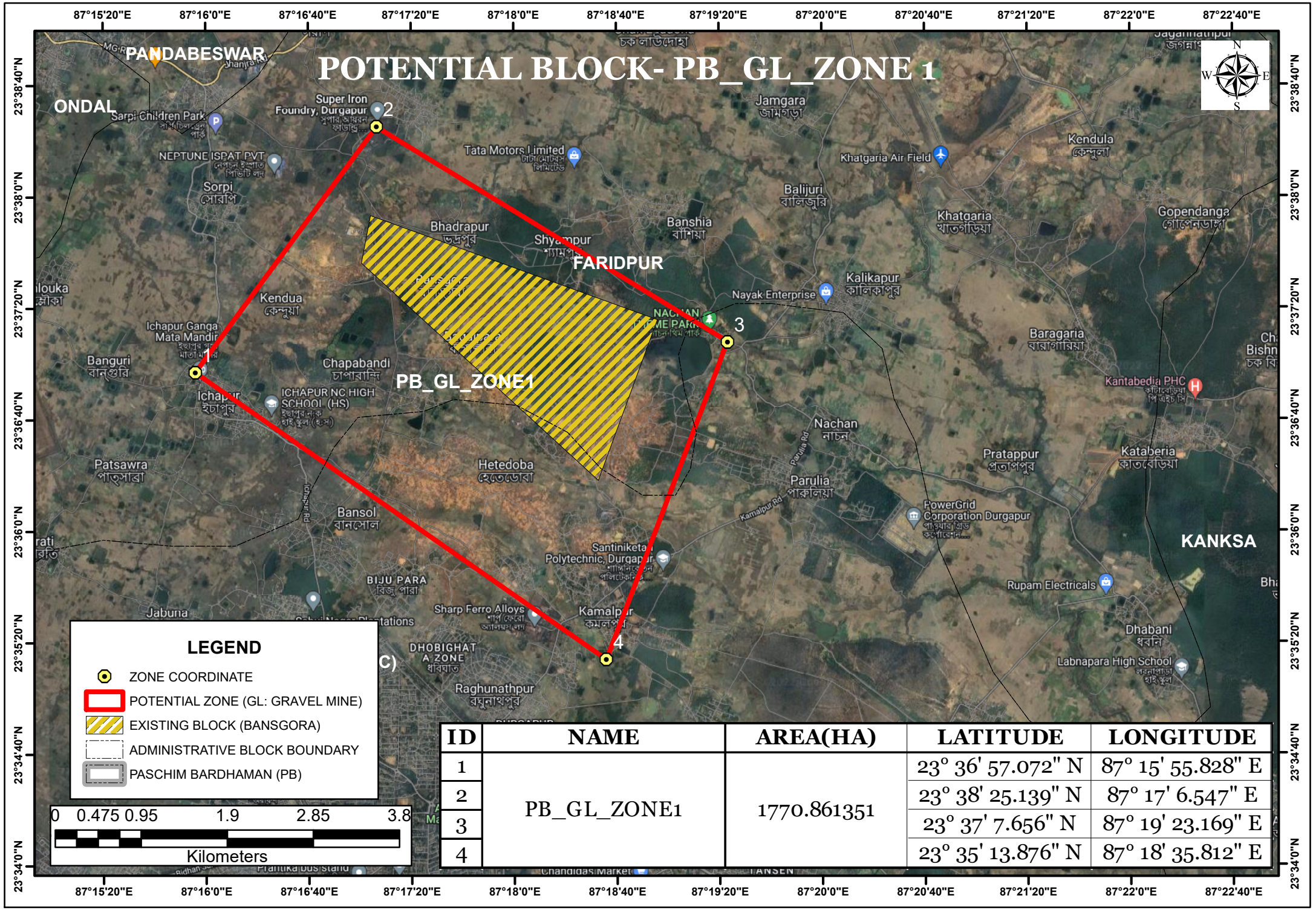
0 0.075 0.15 0.3 0.45 0.6

Kilometers

NAME	AREA (HA)	POINT ID	LATITUDE	LONGITUDE
PB_BS_ZONE_17	30.623964	1	23° 47' 14.576" N	86° 50' 11.272" E
		2	23° 47' 31.948" N	86° 50' 23.967" E
		3	23° 47' 25.061" N	86° 50' 36.199" E
		4	23° 47' 3.628" N	86° 50' 23.761" E

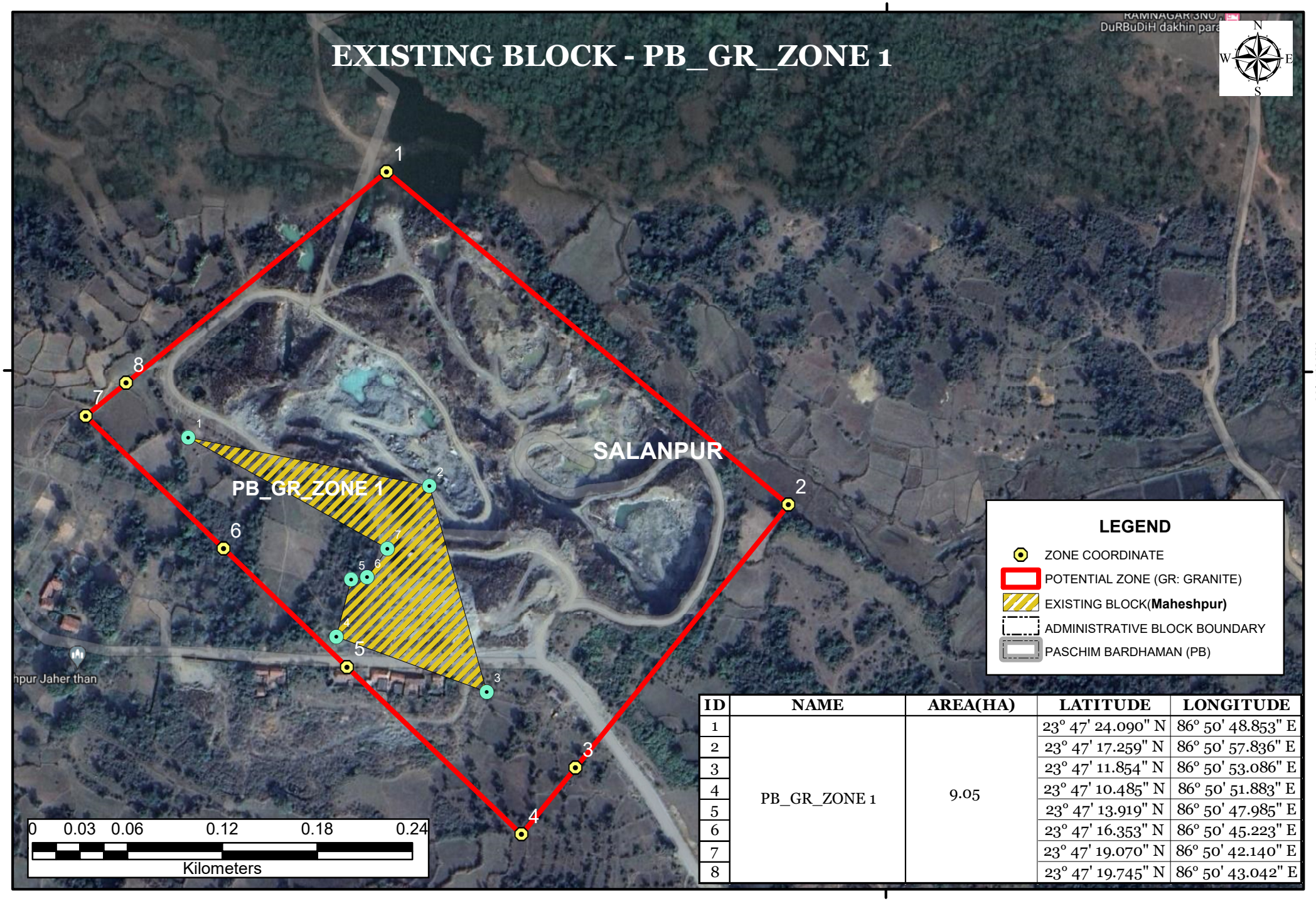
EXISTING BLOCK - PB_CC_ZONE 1

ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_CC_ZONE1	0.465884	23° 40' 25.015" N	87° 24' 48.787" E
2			23° 40' 27.258" N	87° 24' 49.690" E
3			23° 40' 26.530" N	87° 24' 51.538" E
4			23° 40' 24.182" N	87° 24' 51.166" E

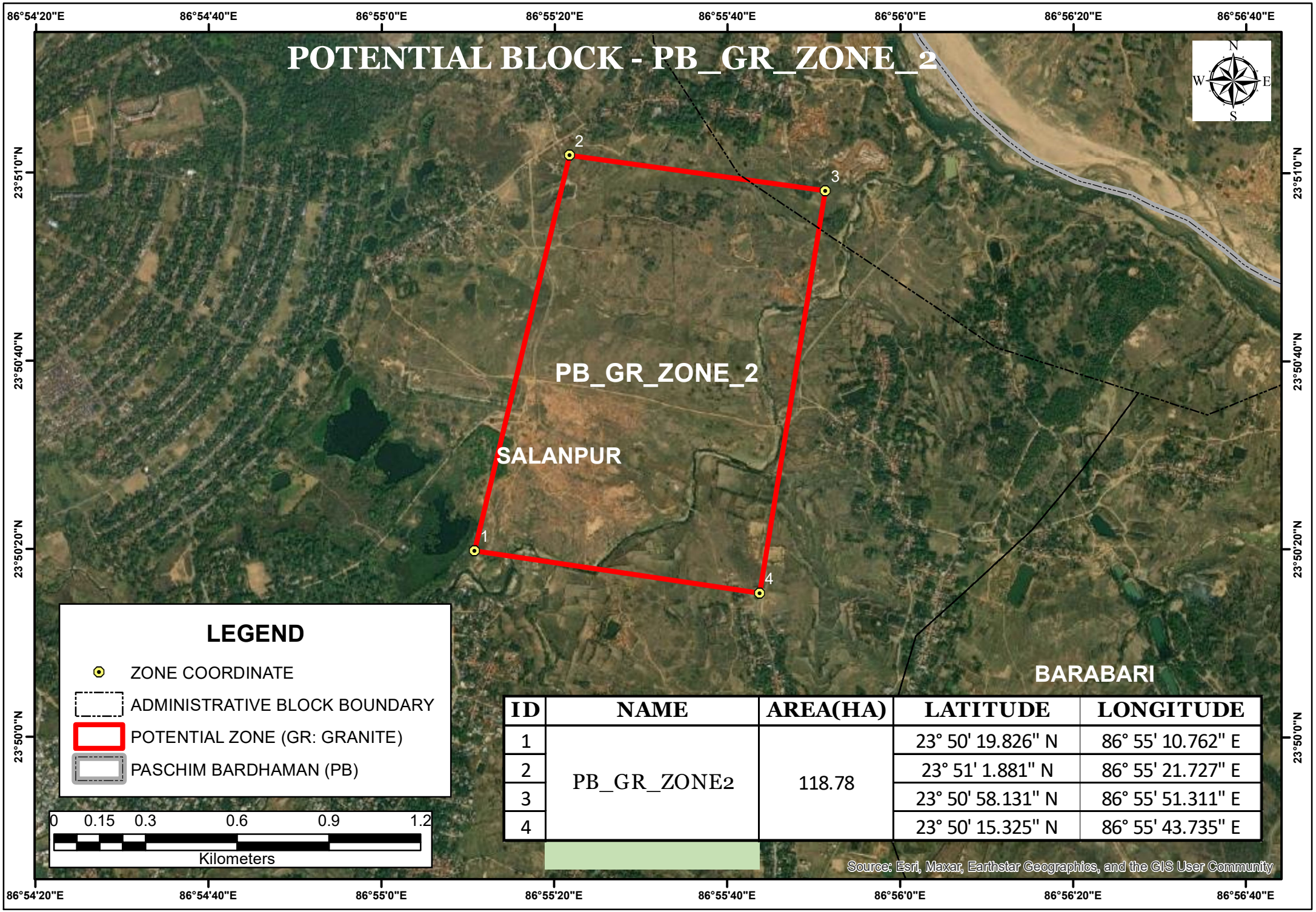


ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_GL_ZONE1	1770.861351	23° 36' 57.072" N	87° 15' 55.828" E
2			23° 38' 25.139" N	87° 17' 6.547" E
3			23° 37' 7.656" N	87° 19' 23.169" E
4			23° 35' 13.876" N	87° 18' 35.812" E

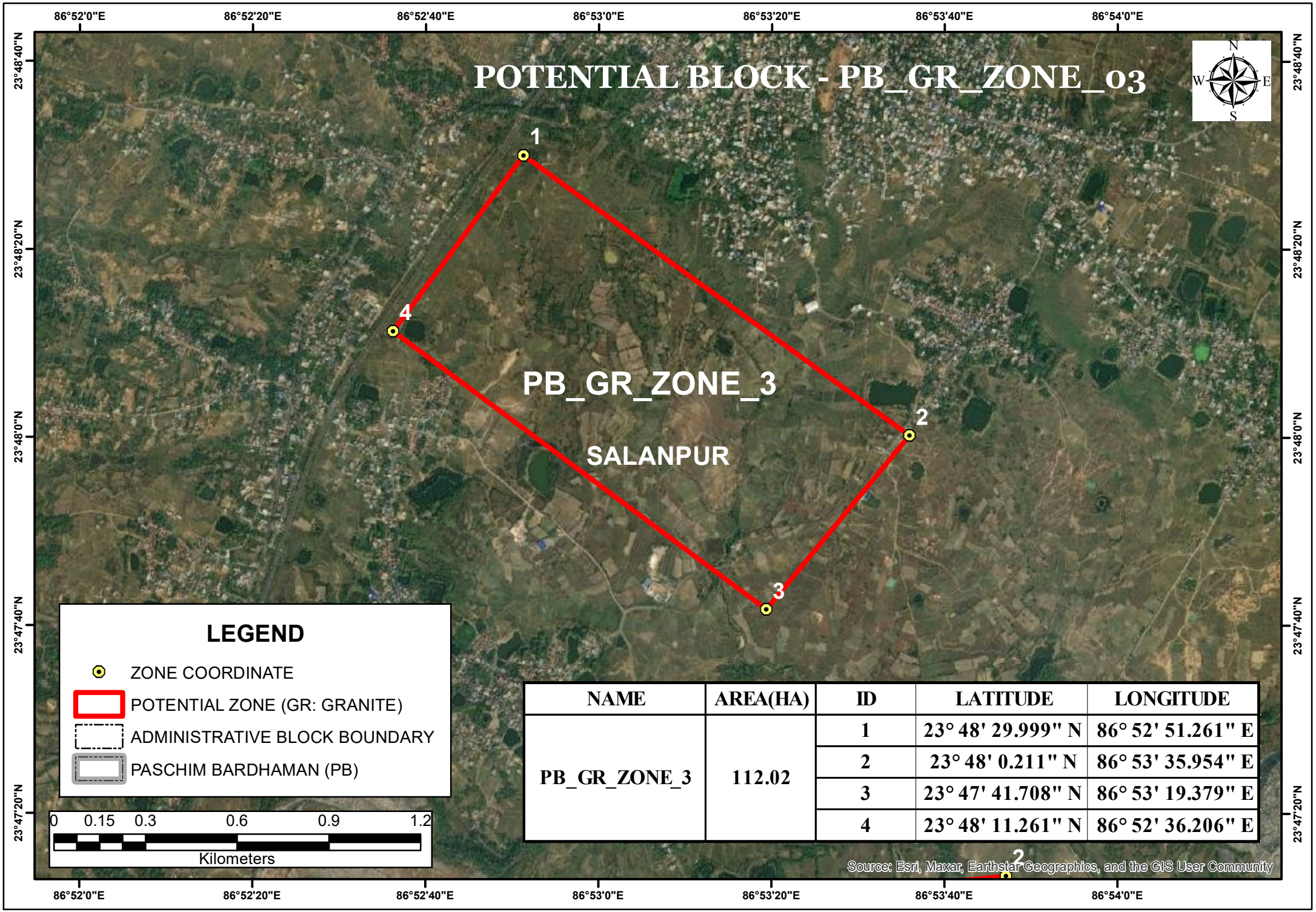
EXISTING BLOCK - PB_GR_ZONE 1



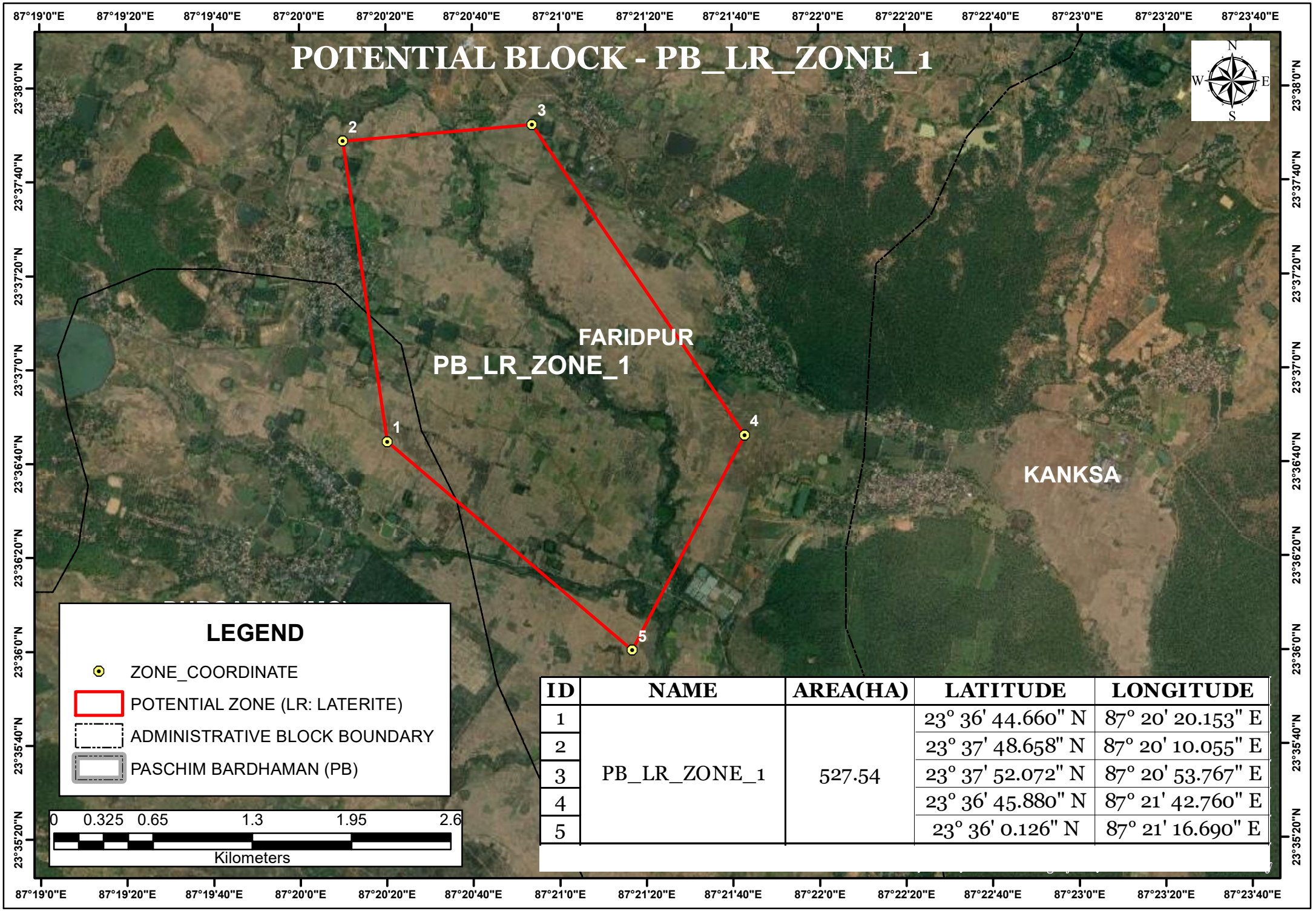
ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_GR_ZONE 1	9.05	23° 47' 24.090" N	86° 50' 48.853" E
2			23° 47' 17.259" N	86° 50' 57.836" E
3			23° 47' 11.854" N	86° 50' 53.086" E
4			23° 47' 10.485" N	86° 50' 51.883" E
5			23° 47' 13.919" N	86° 50' 47.985" E
6			23° 47' 16.353" N	86° 50' 45.223" E
7			23° 47' 19.070" N	86° 50' 42.140" E
8			23° 47' 19.745" N	86° 50' 43.042" E



ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_GR_ZONE2	118.78	23° 50' 19.826" N	86° 55' 10.762" E
2			23° 51' 1.881" N	86° 55' 21.727" E
3			23° 50' 58.131" N	86° 55' 51.311" E
4			23° 50' 15.325" N	86° 55' 43.735" E

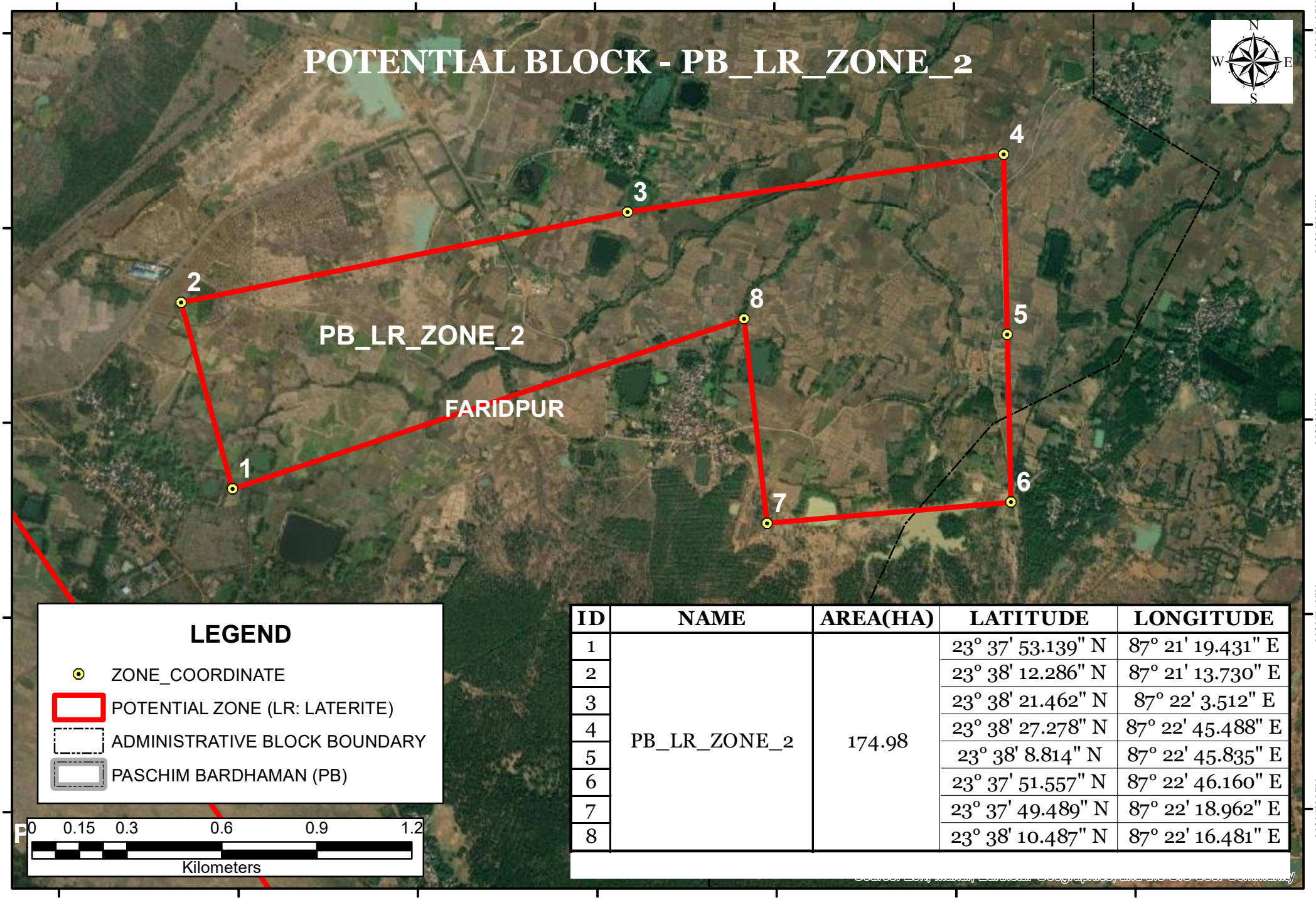


NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_GR_ZONE_3	112.02	1	23° 48' 29.999" N	86° 52' 51.261" E
		2	23° 48' 0.211" N	86° 53' 35.954" E
		3	23° 47' 41.708" N	86° 53' 19.379" E
		4	23° 48' 11.261" N	86° 52' 36.206" E



ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_LR_ZONE_1	527.54	23° 36' 44.660" N	87° 20' 20.153" E
2			23° 37' 48.658" N	87° 20' 10.055" E
3			23° 37' 52.072" N	87° 20' 53.767" E
4			23° 36' 45.880" N	87° 21' 42.760" E
5			23° 36' 0.126" N	87° 21' 16.690" E

POTENTIAL BLOCK - PB_LR_ZONE_2



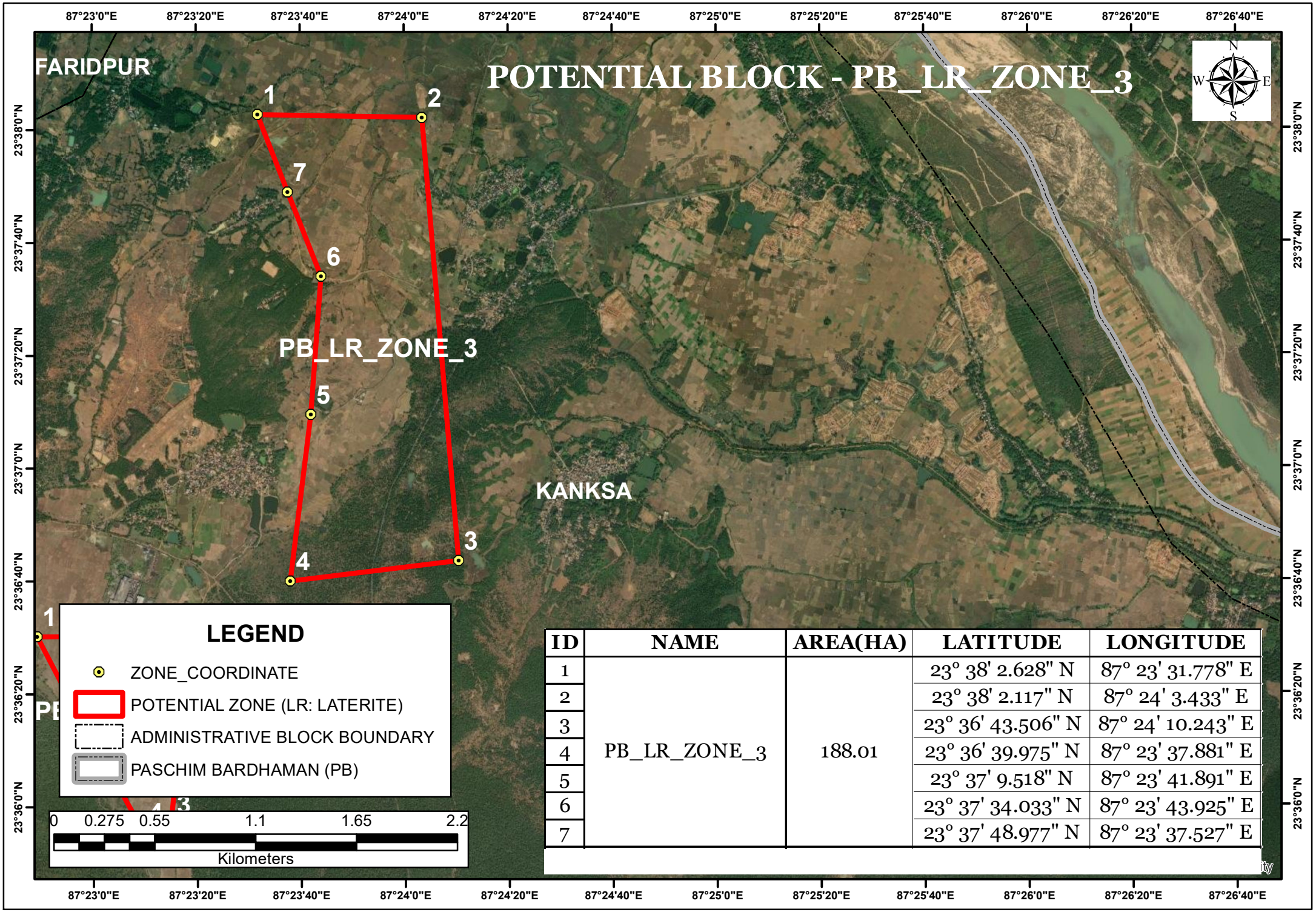
LEGEND

- ZONE_COORDINATE
- POTENTIAL ZONE (LR: LATERITE)
- ADMINISTRATIVE BLOCK BOUNDARY
- PASCHIM BARDHAMAN (PB)

0 0.15 0.3 0.6 0.9 1.2

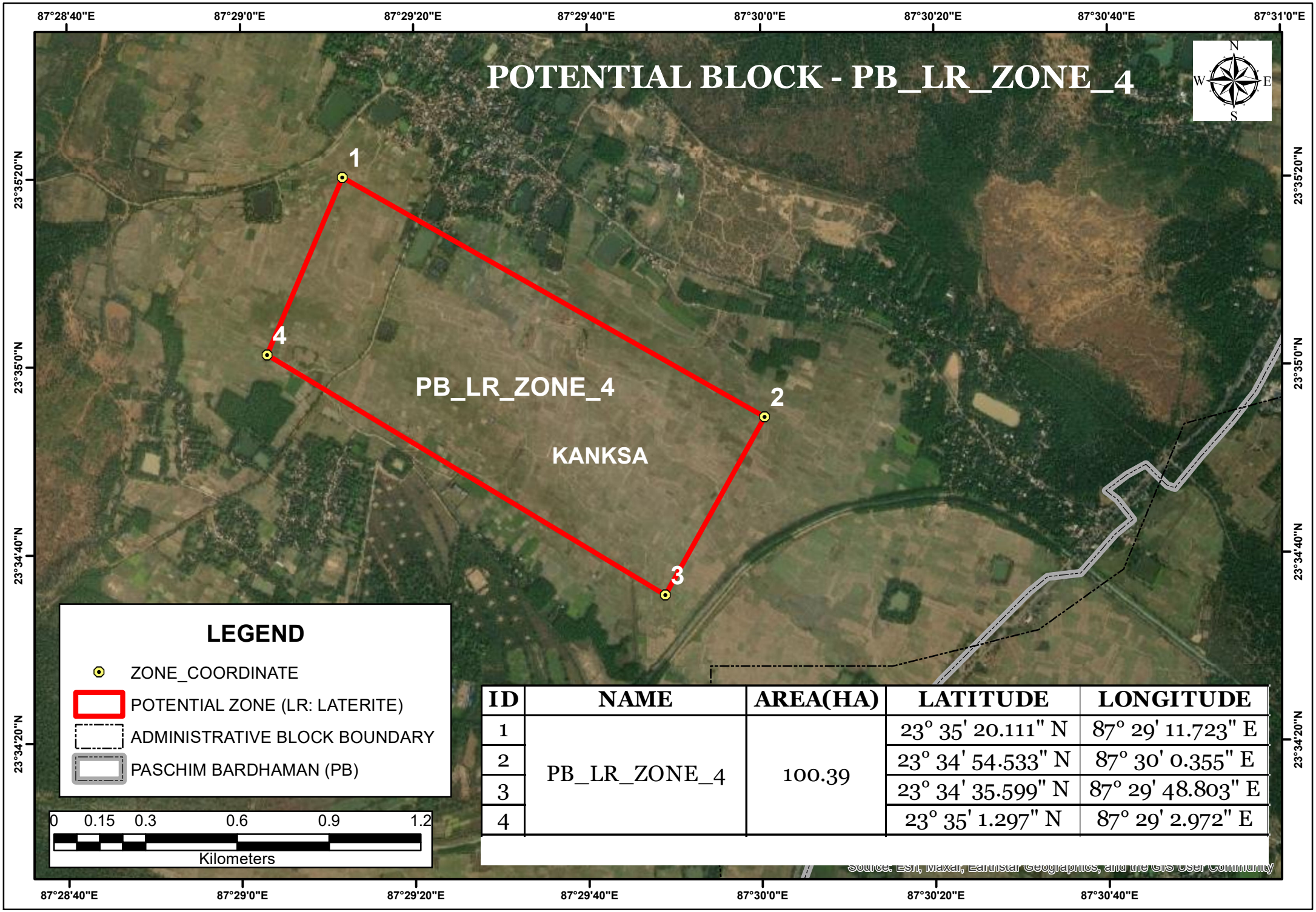
Kilometers

ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_LR_ZONE_2	174.98	23° 37' 53.139" N	87° 21' 19.431" E
2			23° 38' 12.286" N	87° 21' 13.730" E
3			23° 38' 21.462" N	87° 22' 3.512" E
4			23° 38' 27.278" N	87° 22' 45.488" E
5			23° 38' 8.814" N	87° 22' 45.835" E
6			23° 37' 51.557" N	87° 22' 46.160" E
7			23° 37' 49.489" N	87° 22' 18.962" E
8			23° 38' 10.487" N	87° 22' 16.481" E



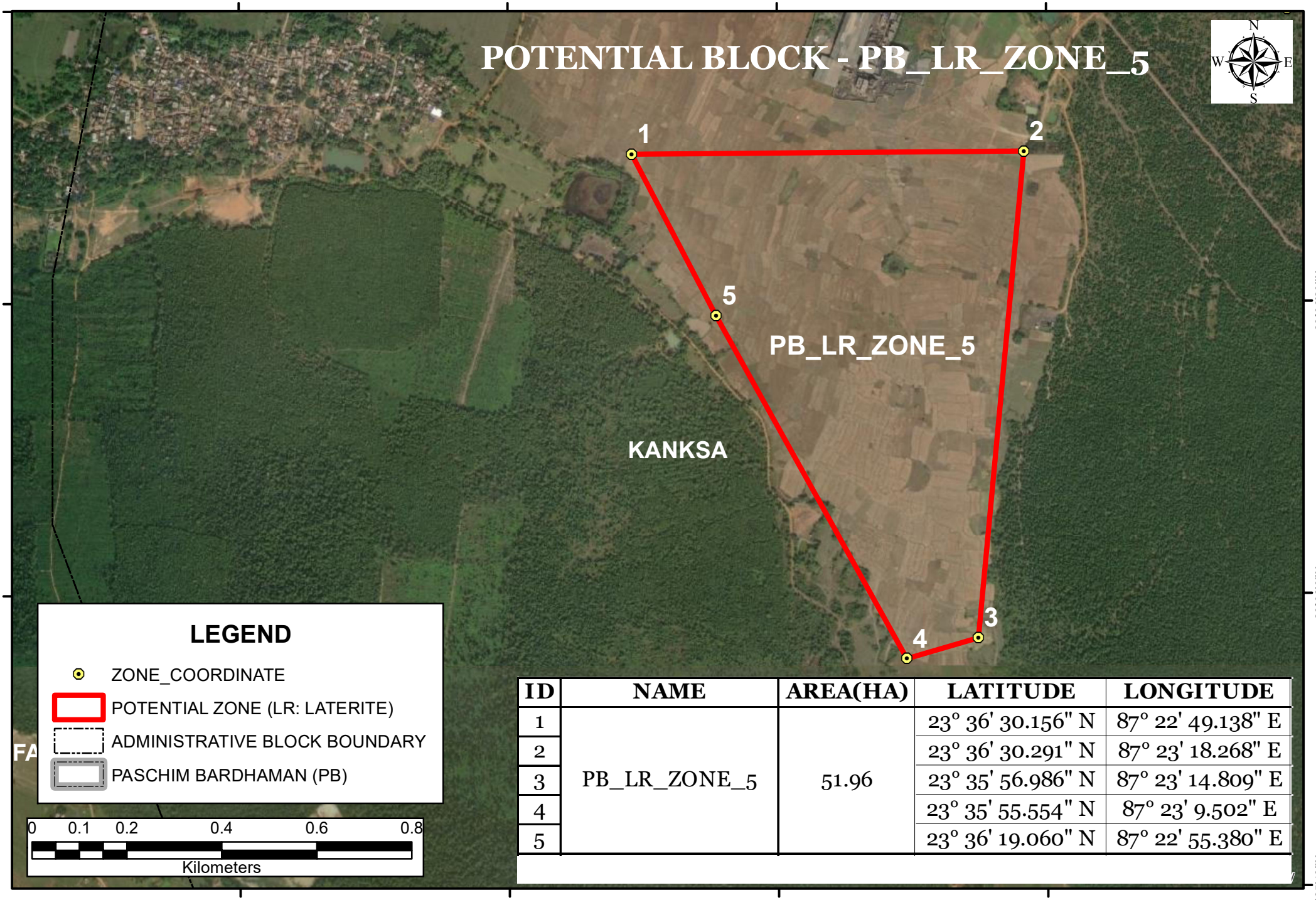
ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_LR_ZONE_3	188.01	23° 38' 2.628" N	87° 23' 31.778" E
2			23° 38' 2.117" N	87° 24' 3.433" E
3			23° 36' 43.506" N	87° 24' 10.243" E
4			23° 36' 39.975" N	87° 23' 37.881" E
5			23° 37' 9.518" N	87° 23' 41.891" E
6			23° 37' 34.033" N	87° 23' 43.925" E
7			23° 37' 48.977" N	87° 23' 37.527" E

POTENTIAL BLOCK - PB_LR_ZONE_4

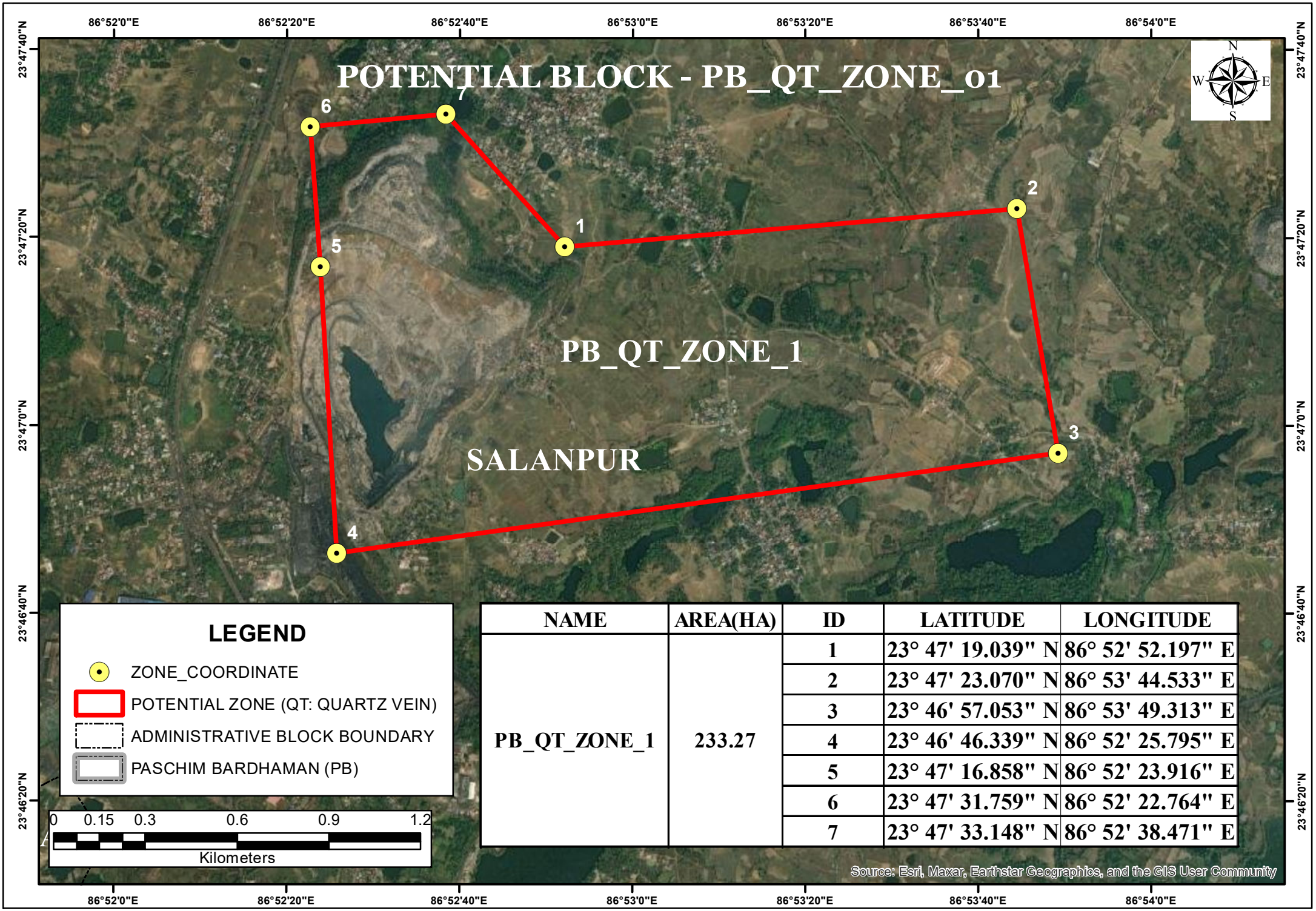


ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_LR_ZONE_4	100.39	23° 35' 20.111" N	87° 29' 11.723" E
2			23° 34' 54.533" N	87° 30' 0.355" E
3			23° 34' 35.599" N	87° 29' 48.803" E
4			23° 35' 1.297" N	87° 29' 2.972" E

POTENTIAL BLOCK - PB_LR_ZONE_5



ID	NAME	AREA(HA)	LATITUDE	LONGITUDE
1	PB_LR_ZONE_5	51.96	23° 36' 30.156" N	87° 22' 49.138" E
2			23° 36' 30.291" N	87° 23' 18.268" E
3			23° 35' 56.986" N	87° 23' 14.809" E
4			23° 35' 55.554" N	87° 23' 9.502" E
5			23° 36' 19.060" N	87° 22' 55.380" E



NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PB_QT_ZONE_1	233.27	1	23° 47' 19.039" N	86° 52' 52.197" E
		2	23° 47' 23.070" N	86° 53' 44.533" E
		3	23° 46' 57.053" N	86° 53' 49.313" E
		4	23° 46' 46.339" N	86° 52' 25.795" E
		5	23° 47' 16.858" N	86° 52' 23.916" E
		6	23° 47' 31.759" N	86° 52' 22.764" E
		7	23° 47' 33.148" N	86° 52' 38.471" E

Annexure 6
SEIAA 70th Meeting (22nd August, 2022) Minutes of Meeting

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State Environment Impact Assessment Authority
Pranisampad Bhawan, 5th Floor, Sector-III, Salt Lake, Kolkata - 700106
(West Bengal)
Minutes of SEIAA Meeting

--***--

Subject:- 70th meeting of SEIAA

Venue:- Conference Room of Environment Department, Prani Sampad Bhavan, 5th Floor, LB Block, Sector III, Salt Lake, Kolkata 700106.

From :- 22 Aug 2022

To :- 22 Aug 2022

1. Proposal No. :- **SIA/WB/MIS/220603/2021** File No- **EN/T-II-1/138/2021** Proposed development of an affordable Housing Complex under Pradhan Mantri Awas Yojana at Premises No. 39/1, Shalimar Road, L.R. Dag No. – 12, 13, 39, 40, 41, 42, 44, 45, 60, 61, 62, 63, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 21, 22, 24, 1, 2, 11, L.R. Khatian No. – 170, 9, 15, 17, J.L. No. – 1, Mouza – Shibpur, Ward No. – 39, Borough – VI, under Howrah Municipal Corporation, P.S. – Shibpur, Howrah – 711103, West Bengal by **M/s. Ideal Riverview Projects Pvt. Ltd.**	Type- **EC**

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIS/220603/2021** dated **09 Aug 2021** along with copies of EIA/EMP seeking environment clearance under the provisions of the EIA Notification, 2006 for the above mentioned project. The proposed project activity is listed at SL.No. **8(a) Building and Construction projects** , under Category **"B2 "** of EIA Notification 2006 and the proposal is appraised at State level.

SEAC recommended the proposed project for Environmental Clearance with the following additional conditions :-

a) Construction activity shall be carried out complying all statutory rules / regulations and sanction plan.
b) Waterbodies shall be maintained as per the approval of Competent Authority.

PROJECT DETAILS

The project of M/s **IDEAL RIVERVIEW PROJECTS PVT. LTD.** located in as follows :

State of the project				
S. No.	**State**	**District**	**Tehsil**	**Village**
(1.)	West Bengal	Howrah	Domjur	Shibpur

14. **Project configuration/product details**

S. No.	Project configuration/product details	Quantity	Unit	Other Unit	Mode of Transport/Transmission of Product	Other Mode of Transport
Eight (8) Residential Towers: Tower 1 to 5 – G + 12 Tower 6 to 8 – G + 1 and						

MISCELLANEOUS

1. Discussion on draft DSRs of Bankura and Paschim Bardhaman.

   The DSRs of Bankura and Paschim Bardhaman are approved.

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State Environment Impact Assessment Authority
West Bengal
Minutes of SEIAA Meeting

--***--

Subject:	**30th meeting of SEIAA (Reconstituted on 17.05.2023)**
Venue:-	**Conference Room of Environment Department, Prani Sampad Bhavan, 5th Floor, LB – Block, Sector – III, Salt Lake, Kolkata – 700106**
From :-	**01 February 2024**
To :-	**01 February 2024**

CONSIDERATION/RECONSIDERATION OF ENVIRONMENTAL CLEARANCE

(1) Proposed Synthetic Resin Manufacturing Unit of 18000 TPA at Dag no. 322, 323, 324, 325, 339, 340; Vill - Kanchowki, Bishnupur, Dist- South 24 Parganas, Kolkata-743503, West Bengal by **M/s. Pacific Plywoods Pvt. Ltd..**

Proposal No. :- SIA/WB/IND3/435073/2023, File No. : EN/T-II-1/016/2020, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/IND3/435073/2023** dated **01 August 2023** along with copies of EIA/EMP seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **5(f) Synthetic organic chemicals industry** projects under Category "**B1**" of EIA Notification 2006.

The PP obtained Terms of References (TORs) issued by SEIAA, West Bengal vide Memo no. 58/EN/T-II-1/016/2020 dated 17.01.2022 against proposal no. SIA/WB/IND2/54818/2020.

SEAC, during its 22nd meeting held on 20.12.2023, recommended the proposed project for Environmental Clearance.

The proposal was placed before SEIAA in its 28th meeting held on 05.01.2024 and decided to visit the project site to study the feasibility of the project. SEIAA visited the project site including parts of the adjoining existing project of M/s Centuryply Pvt. Ltd. on 09.01.2024.

PROJECT DETAILS

The project of **M/s. Pacific Plywoods Pvt. Ltd.** located in as follows :

S. No.	State	District
(1.)	West Bengal	South 24 Parganas

DELIBERATION IN SEIAA

During site visit the following observations were made –

1. **The project site of M/s. Pacific Plywoods Pvt. Ltd is lying vacant and bounded by barbed wire fence.**
2. **The access to the project site from the Diamond Harbour Road is only through the project site of M/s Centuryply Pvt Ltd. The project is dependent on the use of one of the internal road and gate of project of M/s Centuryply Pvt Ltd.**

List of the projects which were placed before the SEIAA, WB in the thirtieth meeting held on 01.02.2024 and the Summary Decisions thereof:

Sl. No.	Proposal	Summary Decision
CONSIDERATION/RECONSIDERATION OF ENVIRONMENTAL CLEARANCE		
1.	Proposed Synthetic Resin Manufacturing Unit of 18000 TPA at Dag no. 322, 323, 324, 325, 339, 340; Vill - Kanchowki, Bishnupur, Dist- South 24 Parganas, Kolkata-743503, West Bengal by **M/s. Pacific Plywoods Pvt. Ltd.** (Proposal No. **SIA/WB/IND3/435073/2023**)	Deferred for additional information
2.	Proposed Belmula Sand Mine over an area of 2.60 ha (6.42 Acres) on the Subarnarekha River at Plot No: 781(P), J.L. No.- 57 Mouza: Belmula, P.S. Dantan, District: Paschim Medinipur, West Bengal by **Sankar Das.** (Proposal No. **SIA/WB/MIN/447148/2023**)	Approved for Environmental Clearance
3.	Proposed Chhotapasha Sand Mine on Kangshabati River at JL No. - 535, Plot No.- 266(P), Mouza – Chhotapasha, P.S. - Keshpur, District- Paschim Medinipur, West Bengal by **Sheikh Mursed Ali.** (Proposal No. **SIA/WB/MIN/260697/2022**)	Approved for Environmental Clearance
4.	Proposed Asanbani Blackstone Mine over an area of 4.980 ha at J.L. No. - 75 Plot No. - 499, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 514/1556, 515, 516, 518, 520, 521, 522, 523, 524, 525, 527, 528, 529, 530, 531, 532, 533, 535, 536, 537, 538, 539, Mouza – Asanbani, Taluka – Mejia, P.S. & Block – Mejia, Dist. – Bankura, West Bengal by **M/s. RKC Infrastructure Private Limited.** (Proposal No. **SIA/WB/MIN/446272/2023**)	Approved for Environmental Clearance
CONSIDERATION OF TOR PROPOSALS		
1.	Proposed Environmental Clearance for their existing Ambrettolide manufacturing unit 24 TPA capacity at Dag. No. 259, 263, Mouza - Bamunari, J. L No. : 25, NH-2, Delhi Road, Vill. & P.O. - Bamunari, P.S. Dankuni, Dist. Hooghly, PIN - 711250, West Bengal by **M/s. Saraogi Shellac and Aromatics.** (Proposal No. **SIA/WB/IND3/449388/2023**)	Rejected
MISCELLANEOUS		
1.	Hearing before SEIAA regarding the proposed project of Shree Kolkata Cement Plant (Clinker Grinding Unit) with cement production capacity of 2.5 Million TPA (OPC, PPC, PSC, Composite Cement, SRC & RHPC) D.G. sets of 1250 kVA (1000 kVA or 2 x 500 kVA & 250 kVA) along with Railway siding at Village & Mouza: Kaijuri & Rauta, Near Birshibpur Railway Station, PS: Uluberia - I Taluka: Uluberia, District: Howrah, West Bengal by **M/s. Shree Cement North Private Limited.** (Proposal No. **SIA/WB/IND1/404126/2022**)	Absent

Sl. No.	Proposal	Summary Decision
2.	Processing of sand mining applications a) Order of Hon'ble NGT in O.A. No. 190/2023/EZ dated 15.01.2024, O.A. No. 17/2024/EZ dated 15.01.2024, O.A. No. 09/2024/EZ dated 23.01.2024 and O.A. No. 13/2024/EZ dated 23.01.2024. b) Request letter from project proponents whose applications were rejected because of date of application being beyond 60 days of date of uploading of DSR in the District website.	a) Proposals are already under processing and after disposal the same would be communicated to Hon'ble NGT. b) All the rejected applicants for DSR time limit would be intimated to apply afresh.
3.	Order of Hon'ble Supreme Court dated 03.01.2024 in Civil Appeal Diary No(s). 50124/2023.	Order of the Hon'ble Supreme Court would be communicated to the project proponent.
4.	Revised DSRs of the districts Purba Bardhaman & Paschim Bardhaman.	Approved

Annexure 7

Reasons For DSR Modification

DSR AMENDMENT STATEMENT

Objectives for DSR Modification

- The primary need for Modification of DSR is to include in-situ minor mineral potential zones of the district. The government of West Bengal implemented a Policy of Mining of Minor Minerals in Private/ Raiyati Land in West Bengal. The minor mineral (Sand/ other than Sand) mining can only be possible if the potentiality is mentioned in the approved DSR, and then only environmental clearance of the mining block will be granted.
- Also, to in-corporate district boundary revision based on Survey of India database instead of district portal information.

Modifications:

1. Modified text part (Chapters) of the DSR to include both Sand and Other than Sand minerals resources of the district. Amendment DSR contain chapters in following manners.

Table 1: Distribution of chapters in the DSR

GENERAL PART	PART A- RIVERBED DEPOSITS	PART B- INSITU MINOR MINERAL DEPOSITS
General Profile of the District	Overview of mineral resources	In-situ Minerals Reserve and potentiality
Physiography of the District	Sand and other riverbed minerals	Mineral Development Prospect of the district
Land Use Pattern of The District	Drainage System	Existing Minor Mineral Leases of the District
Geology	Annual deposition of riverbed minerals	Exploration Requirement of the district
	Replenishment Study as per EMGSM guidelines 2020	Remedial measure to mitigate the impact of Mining
	Total potential of minor mineral in the river bed	Suggested reclamation plan for already mined out areas
	Overview Of Mining Activity in The District	Risk assessment & disaster management plan
	Details Of Revenue Generated from Mineral Sector During Last Five Years	

2. Modification in In-situ minor mineral potential resources. In-situ potential zones are demarcated based on the available Geological information from GSI and DMM. Wherever possible, potential blocks are also identified based on the LOI issued to various mine owners under West Bengal Raiyati policy. A total 30 potential zone has been demarcated, previously it was 9 nos.
3. Modification/ addition of potential in-situ zones in the DSR is the dynamic process and will be updated on regular basis due effectiveness of Raiyati Policy under which Raiyat are applying for mining leases. Therefore, the changes/ amendment will be made in the DSR on regular intervals to includes mining leases approved by authority.
4. District boundary modified in the amended DSR. Previously district boundary was collected from district portal and in the present DSR boundary was collected from Survey of India and it's verified from district authority for any modification.
5. Hyperlink of District boundary modification

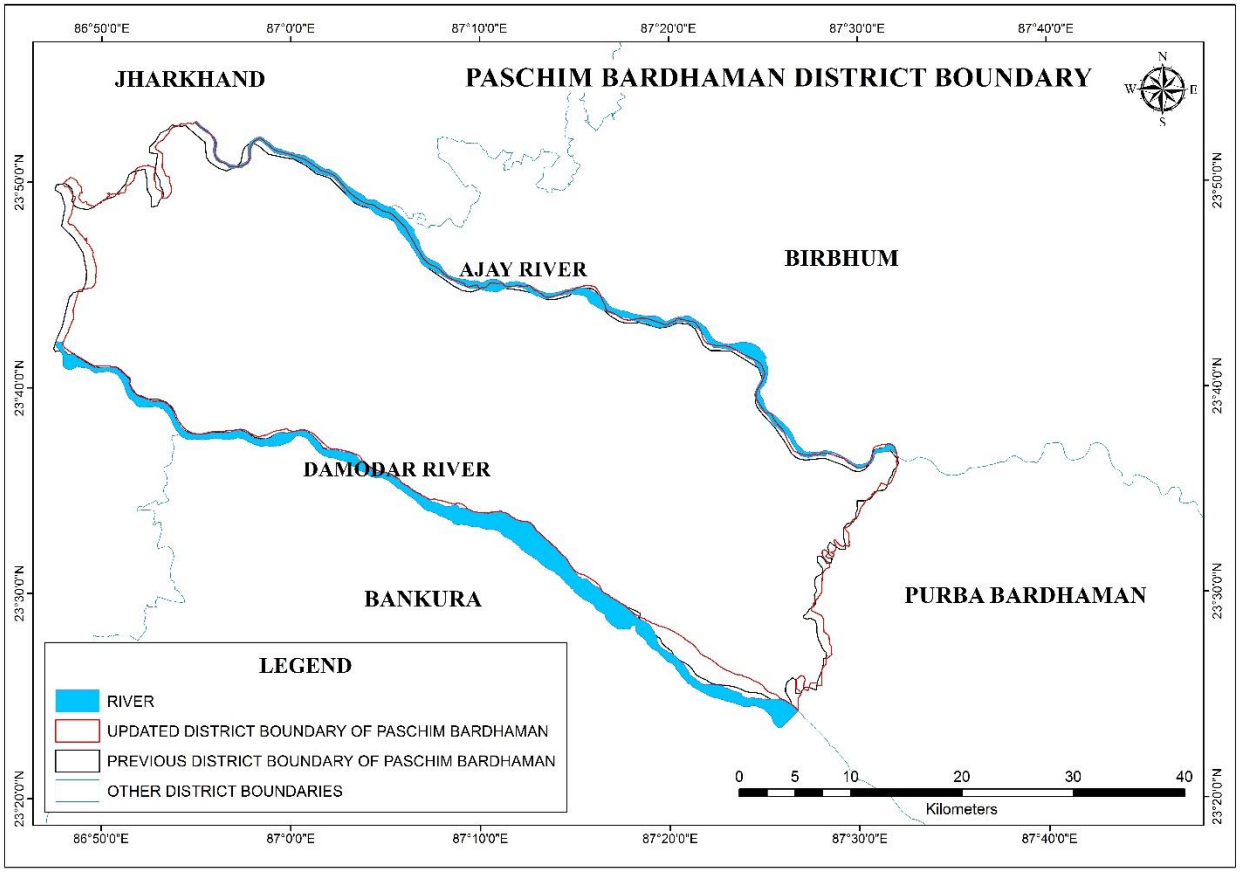
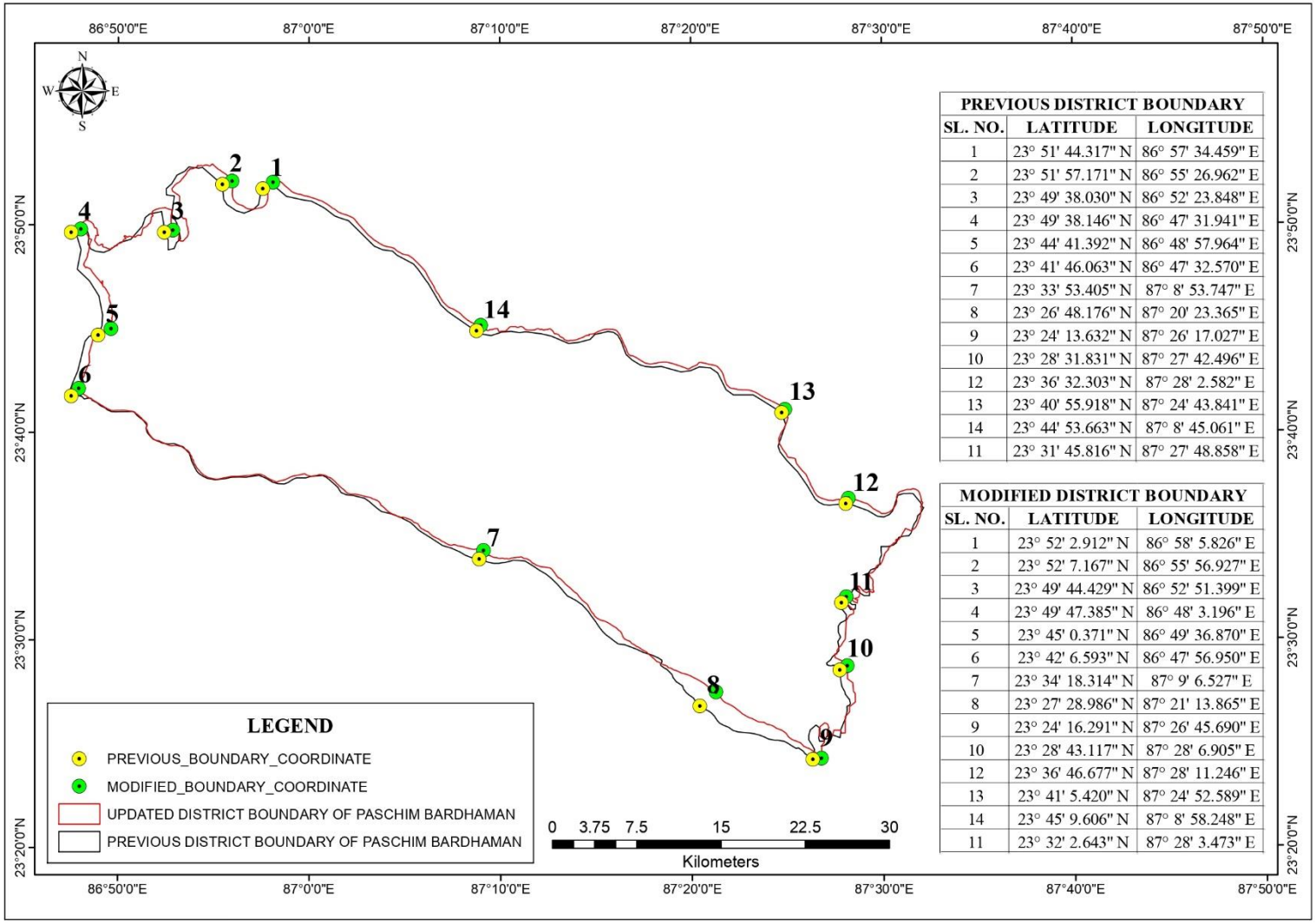


Figure 1: Map showing changes in district boundary



PREVIOUS DISTRICT BOUNDARY		
SL. NO.	LATITUDE	LONGITUDE
1	23° 51' 44.317" N	86° 57' 34.459" E
2	23° 51' 57.171" N	86° 55' 26.962" E
3	23° 49' 38.030" N	86° 52' 23.848" E
4	23° 49' 38.146" N	86° 47' 31.941" E
5	23° 44' 41.392" N	86° 48' 57.964" E
6	23° 41' 46.063" N	86° 47' 32.570" E
7	23° 33' 53.405" N	87° 8' 53.747" E
8	23° 26' 48.176" N	87° 20' 23.365" E
9	23° 24' 13.632" N	87° 26' 17.027" E
10	23° 28' 31.831" N	87° 27' 42.496" E
12	23° 36' 32.303" N	87° 28' 2.582" E
13	23° 40' 55.918" N	87° 24' 43.841" E
14	23° 44' 53.663" N	87° 8' 45.061" E
11	23° 31' 45.816" N	87° 27' 48.858" E

MODIFIED DISTRICT BOUNDARY		
SL. NO.	LATITUDE	LONGITUDE
1	23° 52' 2.912" N	86° 58' 5.826" E
2	23° 52' 7.167" N	86° 55' 56.927" E
3	23° 49' 44.429" N	86° 52' 51.399" E
4	23° 49' 47.385" N	86° 48' 3.196" E
5	23° 45' 0.371" N	86° 49' 36.870" E
6	23° 42' 6.593" N	86° 47' 56.950" E
7	23° 34' 18.314" N	87° 9' 6.527" E
8	23° 27' 28.986" N	87° 21' 13.865" E
9	23° 24' 16.291" N	87° 26' 45.690" E
10	23° 28' 43.117" N	87° 28' 6.905" E
12	23° 36' 46.677" N	87° 28' 11.246" E
13	23° 41' 5.420" N	87° 24' 52.589" E
14	23° 45' 9.606" N	87° 8' 58.248" E
11	23° 32' 2.643" N	87° 28' 3.473" E

Figure 2: Map showing major shifting in district boundary

6. Due to district boundary modification, potential sand bars also changed, and, in some cases, new sandbar added with respect to 2022 satellite images. Changes in sand resources are tabulated below.

Sl. No.	River or Stream	Considered Thickness (m)	Area recommended for mineral potential (as per approve DSR) (sq.km)	Mineable mineral potential (As per approve DSR) (million cubic meter)	Area recommended for mineral potential (as per modified DSR) (sq.km)	Mineable mineral potential (As per Modified DSR) (million cubic meter)	Resource modification (million cubic meter)
1	Ajay	3	1.13	2.04	7.88	14.18	12.14
2	Damodar	3	3.15	5.67	1.41	2.53	-3.14
3	Barakar	2	0.89	1.07	0	0	-1.07

7. Sandbar addition/deletion are highlighted below:

SANDBAR AS PER MODIFIED DSR	SANDBAR AS PAER APPROVED DSR	REMARKS
AJAY RIVER		
PSBD_SL_AJ_01B_01C		Added due to District Boundary modification
PSBD_BR_AJ_01_02	PSBD_BR_AJ_01_02	No changes
PSBD_BR_AJ_03	PSBD_BR_AJ_03	No changes
PSBD_BR_AJ_03_04	PSBD_BR_AJ_03_04	No changes
PSBD_BR_AJ_05	PSBD_BR_AJ_05	No changes
PSBD_BR_AJ_05_I		Added due to District Boundary modification
PSBD_BR_AJ_05A		Added due to District Boundary modification
PSBD_BR_AJ_05B_05C_05D_05E		Added due to District Boundary modification
PSBD_BR_AJ_05G		Added due to District Boundary modification
PSBD_BR_AJ_05H		Added due to District Boundary modification
PSBD_JM_AJ_05I_1		Added due to District Boundary modification
PSBD_JM_AJ_05I_2		Added due to District Boundary modification
PSBD_JM_AJ_05I_3		Added due to District Boundary modification
PSBD_JM_AJ_06	PSBD_JM_AJ_06	No changes
PSBD_JM_AJ_06_1		Added due to District Boundary modification
PSBD_JM_AJ_07	PSBD_JM_AJ_07	No changes
PSBD_JM_AJ_07_I		Added due to District Boundary modification
PSBD_JM_AJ_07B_07C		Added due to District Boundary modification
PSBD_JM_AJ_07C_07D_7E		Added due to District Boundary modification
PSBD_JM_AJ_07C_07D_7E_I		Added due to District Boundary modification
PSBD_JM_AJ_07E		Added due to District Boundary modification
PSBD_JM_AJ_08	PSBD_JM_AJ_08	No changes
PSBD_JM_AJ_08B_08C		Added due to District Boundary modification

SANDBAR AS PER MODIFIED DSR	SANDBAR AS PAER APPROVED DSR	REMARKS
PSBD_JM_AJ_08D		Added due to District Boundary modification
PSBD_JM_AJ_08D_I		Added due to District Boundary modification
PSBD_JM_AJ_08E_1		Added due to District Boundary modification
PSBD_PB_AJ_09_10		Added based on 2022 satellite image
PSBD_PB_AJ_10		Added based on 2022 satellite image
PSBD_PB_AJ_10A_I		Added due to District Boundary modification
PSBD_FR_AJ_10A_II		Added due to District Boundary modification
PSBD_FR_AJ_10B_I		Added due to District Boundary modification
PSBD_FR_AJ_10C_I		Added due to District Boundary modification
PSBD_FR_AJ_10C_II		Added due to District Boundary modification
PSBD_KN_AJ_10D_I		Added due to District Boundary modification
PSBD_KN_AJ_11	PSBD_KN_AJ_11	No changes
OSBD_KN_AJ_12	PSBD_KN_AJ_12	No changes
PSBD_KN_AJ_12A_I		Added due to District Boundary modification
PSBD_KN_AJ_12B		Added due to District Boundary modification
OSBD_KN_AJ_13	PSBD_KN_AJ_13	No changes
PSBD_KN_AJ_13_I		Added based on 2022 satellite image
DAMODAR RIVER		
PSBD_AN_DA_01	PSBD_AN_DA_01	No changes
	PSBD_AN_DA_02 - PSBD_KN_DA_04	Deleted due to District Boundary modification
BARAKAR RIVER		
	PSBD_AS_BK_01 - PSBD_SL_BK_09	Deleted due to District Boundary modification