# DISTRICT SURVEY REPORT OF PURBA BARDHAMAN DISTRICT (Modified)

(For mining of minor minerals)

As per Notification No.S.O.141 (E) New Delhi Dated 15<sup>th</sup> of January 2016, S.O.3611 (E) New Delhi Dated 25<sup>th</sup> of July 2018 and Enforcement & 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 30<sup>th</sup> Meeting of SEIAA under Miscellaneous Section, Point No.4)

# 1<sup>st</sup> Modification: 29<sup>th</sup> November 2023 1<sup>st</sup> Approval: 8<sup>th</sup> September 2022



Version- 2



## **Brief About Modifications**

Version No	DSR Status	Date	Remarks
Version-1	1 <sup>st</sup> Approved DSR	08/09/22	DSR prepared as per guidelines.
Version-2	1 <sup>st</sup> Modification	29/11/23	DSR modified to incorporate district boundary modification and inclusion of potential deposits of insitu mineral.



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

No. 487 MD/2C-683/2022

Kolkata, the 22<sup>nd</sup> December, 2023

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

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

Sir,

Enclosed please find the soft copy of the Modified District Survey Report (DSR) of Purba 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,

5 21/12/23

DIRECTOR OF MINES & MINERALS. GOVERNMENT OF WEST BENGAL.

No. 487/1(2) MD/2C-683/2022

Kolkata, the 221 December, 2023

Copy forwarded for information to:

1) The Member Secretary, SEIAA, West Bengal.

0/c

 The Chairman & Managing Director, West Bengal Minerals Development & Trading Corporation Ltd.

Az1/12/23

DIRECTOR OF MINES & MINERALS. GOVERNMENT OF WEST BENGAL.

Darfui. 21/12/2023



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

No. 488 MD/2C-683/2022

Kolkata, the 22 December, 2023

#### TO WHOM IT MAY CONCERN

This is to certify that the Modified District Survey Report of Purba 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 Purba Bardhaman District and found the same to be in order.

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

Ba1/12/23

DIRECTOR OF MINES & MINERALS. GOVERNMENT OF WEST BENGAL.

Danfin. 21/12/2023

#### GOVERNMENT OF WEST BENGAL OFFICE OF THE DISTRICT LAND AND LAND REFORMS OFFICER PURBA BARDHAMAN P.O. RAJBATI, BARDHAMAN. PIN CODE: 713104 Phone no.0342-2530641/ Fax no.0342-2533348/e-mail:dlroburdwan@gmail.com

Memo No.\_PBD-54015(99)/20/2023/MM/...8.8.2....

Date: 29/ 11 /2023.

To, The Executive Director, WBMDTCL, WBIIDC Building, 3<sup>rd</sup> Floor, DJ-10, DJ Block, Sector-II, Salt Lake, Kol-700 091.

#### Sub.: Proposed Modification of District Survey Report in Purba Bardhaman. Ref: Your Memo No. MDTC/Sand/002/Part-2/2148, Dated-10.08.2023

With reference above, this is to inform you that as directed vide memo above a soft copy of modified DSR of District Purba Bardhaman has been sent to the D.I.O, NIC, Purba Bardhaman for uploading in the District Website and the claims & objections have been received from the interested persons.

The claims and objections (enclosed here with) are being sent to your end for further course of action.

Enclo.: As stated.

29.11.23

Additional District Magistrate & District Land & Land Reforms Officer, Purba Bardhaman

Memo No.\_PBD-54015(99)/20/2023/MM/...882

Date: 29 / 11 /2023.

#### Copy forwarded for kind information to:

1. The Director of Mines & Minerals, West Bengal.

29.11.22

Additional District Magistrate & District Land & Land Reforms Officer, Purba 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
IMD – Indian Meteorological Department ISRO - The Indian Space Research Organization
IMD – Indian Meteorological Department ISRO - The Indian Space Research Organization KM - Kilometer
IMD – Indian Meteorological Department ISRO - The Indian Space Research Organization KM - Kilometer LISS - Linear Imaging Self-Scanning Sensor
IMD – Indian Meteorological Department ISRO - The Indian Space Research Organization KM - Kilometer LISS - Linear Imaging Self-Scanning Sensor LOI - Letter of Intent
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
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 <sup>2</sup> - Square meter
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 <sup>2</sup> - Square meter MBT - Main Boundary Thrust
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 <sup>2</sup> - Square meter MBT - Main Boundary Thrust MCT - Main Central Thrust
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 <sup>2</sup> - Square meter MBT - Main Boundary Thrust MCT - Main Central Thrust MFT - Main Frontal Thrust
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 <sup>2</sup> - Square meter MBT - Main Boundary Thrust MCT - Main Central Thrust MFT - Main Frontal Thrust



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

West Bengal Raiyati Policy 2022

PRE PRE MONSOON

PO POST MONSOON

PBBD PURBA BARDHAMAN

MK MANGOLKOTE

KG1 KETUGRAM 1

KG2 KETUGRAM 2

KT1 KATWA 1

KT2 KATWA 2

PS2 PURBASTHALI 2

GL1 GALSI 1

GL2 GALSI 2

KH KHANDAGHOSH

BD1 BARDHAMAN 1

District Survey Report Purba Bardhaman District, West Bengal



BD2 BARDHAMAN 2

ME1 MEMARI 1

RN2 RAINA 2

BDMCBARDHAMAN MUNICIPALITY

AJ AJAY

- DA DAMODAR
- DW DWARAKESWAR

HO HOOGLY

MOR MORRUM



### <u>Key Definitions</u>

- **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 downstream 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<sup>th</sup> 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.

*Riverbed 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**

The district Purba Bardhaman, one of the important districts of the Burdwan Division, is situated between 23053' N to 22056' N Latitude and 88025' E to 87056' E Longitude. It contains an area of 5432.69 sq.km. The district is bounded on the north by Birbhum and Murshidabad, on the east by Nadia, on the south by Hooghly and Bankura, and on the west by Paschim Bardhaman districts.

Purba Bardhaman district is a flat alluvial plain area that can be divided into four prominent topographical regions. On the north, the Kanksa Ketugram Plain lies along with the Ajay, which joins the Bhagirathi. The Bardhaman Plain occupies the central area of the district, with the Damodar on the south and the south-east. On the southern part is the Khandaghosh Plain. The Bhagirathi flows along the eastern boundary of the district, and the Bhagirathi Basin occupies the eastern part of the district. The undulating laterite topography of Paschim Bardhaman district extends up to the Ausgram area of this district.

The district has considerable area close to river basins that are characterized by Holocene alluvium deposits, which are likely to soften and hence are susceptible to liquefaction during an earthquake. The district falls under the Seismic Zone III indicating the district under moderate seismic intensity zone.

The river system in Barddhaman includes the Bhagirathi-Hooghly in the east, the Ajoy and its tributaries in the north and the Damodar and its branches in the south-west. Besides, there are innumerable Khals and old river beds all over the area.

In Purba Bardhaman district, as per the report published by Directorate of Mines and Minerals, Government of West Bengal, there is no major or minor in-situ minerals noted except lateritic deposits in the western part. The district is having riverbed deposits which are generating revenue for the district mainly.

The district is generating considerable revenue from mining of minor minerals such as riverbed sand deposits. Revenue generated in the district of Purba Bardhaman from Minor minerals during the period of April 2017 to September 2021 is Rs. 79.77 crores.

Potential minor mineral blocks of sand have been identified based on satellite imagery study along with ground truthing and are listed in this District Survey Report. Restriction zones are defined as per the EMGSM guidelines 2020. In Purba Bardhaman district, total 58.38 Mcum potential river bed deposits estimated.

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.

Page 1



### 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 15<sup>th</sup> 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. 25<sup>th</sup>July, 2018 regarding inclusion of the "Minerals Other than Sand" and format for preparation of the DSR has been specified. Enforcement & 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 West Bengal Minor Mineral Concession Rule, 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.

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 district survey report of Purba Bardhaman district also 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 1<sup>st</sup> part contains the general information of the district. The 2<sup>nd</sup> part highlights the riverbed deposits that is sand and gravels. The 3<sup>rd</sup> part of the modified report contains the occurrences of institu minor mineral deposits of the district. The modifications of the DSR of Purulia have been furnished in Annexure 7.



### 2 Introduction

The District Survey Report of Purba 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

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

#### Table 2.1: Statutory Framework and guidelines on DSR with time scale

Particulars
The Ministry of Environment, Forest & Climate Change (MoEF&CC) published
Environmental Impact Assessment Notification 1994 which is only applicable for the Major
In order to cover the minor minerals also into the purview of EIA the MoEF&CChasissued
EIA Notification SO 1533 (E), dated 14th September 2006, made mandatory to obtain
environmental clearance for both Major & Minor Mineral more than 5 Ha.
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.
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 contain amondments in the EIA Natification, 2006, and made mondatow to obtain
EC for all minor minorale. Provisions have been made for the propagation of District survey
report (DSR) for River bed mining and other minor minerals
West Bangel Minor Minorels Concession Bules 201( amonded the Minor and Minorels
(Development and Regulation) Act 1057 (Act 67 of 1057) 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 FIA 2016 also
includes SSMG 2016 for minor mineral mining
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
DSRi.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".

Page 4



2020	Enforcement & 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.					

#### Important statutory Guidelines for sand mining in India:

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

 (a) No person shall undertake mining operation in any area prohibited by the 'State 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 Ievel, 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), 2016by 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 & Monitoring Guidelines for sand Mining, 2020 (MoEF& CC)

The Ministry of Environment Forest & 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 1kilometre (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.
- 1) 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.

#### 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. We need sand 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.



### 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 2.2.1: 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 thedata 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.

<u>Land Use and Land Cover Map</u>: 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 Color Composite) pre-processing, selection of suitable classification approaches, postclassification 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, Pattern, Texture, Shape, Color 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	Vegetation Covered Area - Area with		
Agricultural Land has been identified	continuous Red color tone, Vegetation		
<b>Agricultural Fallow Land</b> - Based on their Geometrical shape, Yellowish green color tone, Agricultural Fallow Land has been identified.	<b>Badland Topography</b> - Area with Non geometrical shape and Yellowish green colortonehas been identified as Bad Land Topography.		
Settlement – Area with some geometrical	Water Bodies – Area with Blue color has		
shape in a Linear Pattern including Light	been classified as Water Bodies.		
Cyan Colorhas been recognized as Settlement			
Area.			

Figure 2.2.2: Pictorial description of Land Use Classification methods

<u>Geomorphological Map</u>: The major step of preparing Geomorphological Map is identifying features like – Alluvial Fan, Alluvial Plain, Hilly Region etc. from Satellite Imagery

District Survey Report Purba Bardhaman District, West Bengal



(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.



Figure 2.2.3: Pictorial description of Geomorphological Units Classification methods

<u>Physiographical Map</u>: 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 obtained from ENVIS Centre on Wildlife & Protected Areas during August 2020.
- > Data has been geo-referenced using GIS software.
- Digitization of Wildlife Sanctuary & National Park and superimposed it over Block Boundary.
- Wildlife Sanctuary & 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, primary data has been collected and field work has also been carried out for 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 river bed 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 potential sand reserve.

Four times 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.



# **GENERAL PART**



### 3 General Profile of the district

#### a) General Information

Purba Bardhaman district is one of the twenty-three districts of West Bengal. It has come into existence on 7th April 2017, after bifurcation of erstwhile Burdwan district and its head quarter is Bardhaman. Purba Bardhaman is an agriculturally prosperous district of West Bengal. This part of the West Bengal is traditionally familiar as the agriculturally developed is known as the '*Granary of the West Bengal*'. It contains an area 5432.69 *km*2 (2097.57 sq miles) as ascertained by the bifurcation, and population (according to 2011 census) is 4,835,532, density of population is 890/km2. The district lies mainly between the river Ajay, the Bhagirathi and the Damodar. The river Barakar forms the State boundary to the west; the Ajay separetes Birbhum and Dumka to the north with exception of a portion of Katwa subdivision; the Damodar forms a southern boundary with Purulia and Bankura, while Bhagirathi forms the main eastern boundary with a few exceptions. The maximum length from east to west is 208 Km while the maximum breadth from north to south is 112 Km.

The district falls under Survey of India Toposheet No.- 73M/10, 73M/11, 73M/12, 73/14, 73M/15, 73M/16, 73N/13, 79A/1, 79A/2, 79 A/4, 79A/5, 79A/6, 79A/7, 79A/8, 79B/1, 81A/3, and 75M/13.

	LATITUDE	LONGITUDE
EAST	23028'52.063"N	87027'9.521"E
WEST	23012'45.047"N	88025'15.183"E
NORTH	23050'28.432"N	87059'39.005"E
SOUTH	22056'53.233"N	87050'42.352"E

EAST	Nadia District		
WEST	Paschim Bardhman District		
NORTH	Murshidabad & Birbhum District		
SOUTH	Hooghly & Bankura District		

The district comprises four subdivisions: -

- Kalna subdivision consists of one municipality at Kalna and five CD blocks: Kalna I, Kalna II, Manteswar, Purbasthali I and Purbasthali II.
- Katwa subdivision consists of two municipalities at Katwa and Dainhat and five CD blocks: Katwa I, Katwa II, Ketugram I, Ketugram II and Mongakote.
- Bardhaman Sadar North subdivision consists of two municipalities at Bardhaman and Guskara and seven CD blocks: Ausgram I, Ausgram II, Bhatar, Burdwan I, Burdwan II, Galsi I and Galsi II.
- Bardhaman Sadar South subdivision consists of one municipality at Memari and six CD blocks: Khandaghosh, Jamalpur, Memari I, Memari II, Raina I and Raina II





**Figure 3.1: Location Map of Purba Bardhaman** (Source: National Informatics Centre and ESRI Base Map)

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Sub-division:	Blocks/ Municipality/ Municipal Corporation	Panchayat		
		Samity	Gram	Gram Sansad
Burdwan	Memari-I	1	10	150
Sadar (South)	Memari-II	1	9	109
	Memari(M)	-	-	-
	Jamalpur	1	13	189
	Raina-I	1	8	128
	Raina-II	1	8	116
	Khandaghosh	1	10	134
Burdwan	Burdwan-I	1	9	144
Sauar (Norui)	Burdwan-II	1	9	105
	Burdwan(M)	-	-	-
	Ausgram-I	1	7	90
	Guskara(M)	-	-	-
	Ausgram-II	1	7	105
	Bhatar	1	14	193
	Galsi-II	1	9	119
Kalna	Purbathali-I	1	7	138
	Purbasthali-II	1	10	141
	Kalna-I	1	9	141
	Kalna-II	1	8	110
	Kalna(M)	-	-	-
	Monteshwar	1	13	171
	Purbathali-I	1	7	138
Katwa	Mongolkote	1	15	186
	Ketugram-I	1	8	114
	Ketugram-II	1	7	82
	Katwa-I	1	9	116
	Katwa-II	1	7	100
	Katwa(M)	-	-	-
	Dainhat(M)	-	-	-

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#### Figure 3.2: Block divisional map of Purba Bardhaman

(Source: National Informatics Centre)

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# b) Climate Condition

Purba 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 1,400 mm, 75% of it falling in the monsoon months. Localised thunderstorms, called kalbaisakhi in Bengali, are a special feature from March until the monsoon sets in.

The cold season starts from about the middle of November and continues till the end of February. March to May is dry summer intervened by tropical cyclones and storms. June to September is wet summer while October and November are autumn.

https://purbabardhaman.nic.in/geography/

# c) Rainfall

The average annual rainfall in the district is 1400mm. The variations in the annual rainfall within the district and from year to year are not large. The rainfall during the monsoon season – June to September – constitutes 75 percent of the annual rainfall; July and August are the rainiest months.

# (https://hydro.imd.gov.in/hydrometweb/(S(c31xot2fu1lahs45tplr2vuh))/DistrictRaifall.aspx)

The information on annual rainfall for the five years from 2016 to 2020 for the district is given in Table 3.2. Average rainfall of the district explained graphically in Figure 3.3.

The Di	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				

## Table 3.2: Annual rainfall (in milimeter) recorded in the District

https://hydro.imd.gov.in/hydrometweb/(S(5mgo3haiyerotp45adbukh3i))/DistrictRaifall.aspx Website of Indian Meteorological Department, Govt. of India





Figure 3.3: Graphical representation of the District rainfall

Temperature:

#### Summer

Paschim Bardhaman district experiences dry and hot summer with maximum temperature of near about  $\approx 40^{\circ}$ C during summer. The district shows a fierce dry heat in the warmer months. The summers in Purba 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 Purba 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 1400 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.

The average maximum and minimum temperature recorded is given in Table 3.3.



Table 3.3: Monthly	mean temperature	(in °C) distributio	n of the District
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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

#### Relative Humidity, Wind speed & Wind direction

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*).

#### d) Topography & Terrain

Purba Bardhaman district is a flat alluvial plain area that can be divided into four prominent topographical regions. On the north, the Kanksa Ketugram Plain lies along with the Ajay, which joins the Bhagirathi. The Bardhaman Plain occupies the central area of the district, with the Damodar on the south and the south-east. On the southern part is the Khandaghosh Plain. The Bhagirathi flows along the eastern boundary of the district, and the Bhagirathi Basin occupies the eastern part of the district. The undulating laterite topography of Purba Bardhaman district extends up to the Ausgram area of this district.

The gradient is westerly to the west and to the east, it is northerly towards Ajay and southerly towards Damodar below the latitude. The Ajay- Damodar inter-stream tract is made up of several stows consisting of vales and low convex spurs which run in almost all directions except north-east and thus lends a very complicated character to local relief.





# Figure 3.4: Physiographic map of the District

(Source: Cartosat-1, Bhuvan India)



## e) Water Course & 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.



**Figure 3.5: Hydrogeological map of the district** <u>http://wbwridd.gov.in/swid/mapimages/BARDDHAMAN.pdf</u>



#### f) 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 aguifer 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 aguifer 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 water level data

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

















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



## g) Drainage System

The river system in Barddhaman includes the Bhagirathi-Hooghly in the east, the Ajay and its tributaries in the north and the Damodar and its branches in the south-west. Besides, there are innumerable Khals and old river beds all over the area.

The notable rivers and khals are Damodar, Bhagirathi, Ajay, Singaram, Kukua, Kunur, Tumuni, Khari, Banka, Chanda-kanki nala, Behula, Gangur, Brahmani, Khandesvari, Karulia nala, Dwaraka or Babla, Koiya nala, Kandarkahal, Kanadamodar, Kananadi, Ghea, Kakinadi etc.

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



Figure 3.8: Drainage map of the District (Source: National Informatics Centre)



## h) Demography

As per the 2011 Census of India data, recast after bifurcation of Bardhaman district in 2017, Purba Bardhaman district had a total population of 4,835,532. There were 2,469,310 (51%) males and 2,366,222 (49%) females. Population below 6 years was 509,855.

As per the 2011 census data, recast after bifurcation of Bardhaman district in 2017, the total number of literates in Purba Bardhaman district was 3,232,452 (74.73% of the population over 6 years) out of which males numbered 1,781,090 (80.60% of the male population over 6 years) and females numbered 1,453,362 (68.66% of the female population over 6 years).

As per the 2011 census data, recast after bifurcation of Bardhaman district, Hindus numbered 3,566,068 and formed 73.75% of the population in Purba Bardhaman district. Muslims numbered 1,251,737 and formed 25.89% of the population. Christians numbered 8,582 and formed 0.18% of the population. Others numbered 9,145 and formed 0.19% of the population. Scheduled Castes and Scheduled Tribes made up 1,487,151 and 327,501 which is 30.75% and 6.77% of the population respectively.

According to the 2011 census, 92.86% of the population in what is now Purba Bardhaman district spoke Bengali, 5.03% Santali and 1.66% Hindi as their first language.

# Table 3.4: Demographic distribution of the District

https://en.wikipedia.org/wiki/Purba\_Bardhaman\_district

Catagory	District	Total	Males	Females
Population	Purba Bardhaman	4835532	2,469,310	2,366,222
Literacy	Purba Bardhaman	3,232,452	1,781,090	1,453,362



Figure 3.9: Population distribution of the District (Source: Census, 2011)



Figure 3.10: Demographic map showing Block-wise Literacy rate of the District (Source: Census, 2011)

# i) Cropping pattern

Purba Bardhaman is an agriculturally prosperous district of West Bengal. The soil and climate of the district favour the production of food grains. The undivided Bardhaman district was the largest producer of rice in West Bengal, and bulk of it was produced in what is now Purba Bardhaman district. Rice, the major crop has three varieties – Aus (in autumn), Aman (in winter) and Boro (in summer). Other than cereals and pulses, cash crops such as mustard, til, jute and potatoes are also grown.

# j) Land Form and Seismicity

**Purba** 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 district position

(Source: <u>https://pib.gov.in/PressReleasePage.aspx?PRID=1740656</u>)



#### Floods:

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

# k) Flora

The flora of Purba Bardhaman district is composed mostly of woody plants. Amongst the flora are: Simul (Salmalia malabarica), neem (Azadirachta indica, amlaki (Phyllanthus emblica), Indian ash tree (Lannea coromandelica), coconut, date palm, tal (Palmyra palm / Borassus flabellifer), bat (banyan/ Ficus benghalensis), asvattha (pipal/ Ficus religiosa), palash (Butea monosperma), krishnachuda (Caesalpinia pulcherrima) and am (mango/ mangifera indica). There are some shrubby plants: ashsheoda (orangeberry/ Glycosmis pentaphylla, pianj (onion), rasun (garlic), rajanigandha (tube rose/Agave amica), gulancha (Tinospora cordifolia), tulsi (basil/ Ocimum tenuiflorum) etc.

The common aquatic or marsh weeds found in jheels (lakes) and swamps of the eastern part of the district (in the Bhagirathi Basin) are: bena (andropogon squarrosos), water hyacinth (Eichhornia crassipes), padma (nelumbo nucifera), hogla (Typha domingensis) etc. (Census, 2011).

# l) Fauna

The mammals of the district include wolf and golden jackal whilst wild boar and monkeys (including hanuman) are seen frequently. Poisonous snakes such as Indian cobra, common krait and Russell's viper, as well as dhamnas and harmless grass snakes are very



common. The common avifauna of the district include red-vented bulbul, bluethroat, Indian robin and common myna. Other bird species include fowls, crows, munia, sparrow, cuckoo, Asian koel, parakeet, woodpecker, kingfisher, owl, vulture, eagle, kite, hawk, stork, duck, pigeon, falco n and heron. The low-lying swampy areas are home to migratory birds in winter.

The principal varieties fish caught are rohu, mrigala, catla, kharke bata (reba), bhangan bata (bata), shrimp (smaller variety of prawn), maurala, pabda, tengra, bele, chela, punti, boal, aid, galda (large variety of prawn), vacha, chital, pholoi, khaira, fensa, silon, and bhola. (Census, 2011).

Location of Wild Life Sanctuary and National Parks are shown in the Map of West Bengal (Figure 3.13).







**The Ramnabagan Wildlife Sanctuary** was declared as a reserved forest in the year 1960 and is known for its abundance of chital and barking deer. The Ramnabagan Mini Zoo is a part of the wildlife sanctuary and spreads over an area of 14.31 hectares in the area of Mouza Baburbag in Bardhaman. This is under the control of Divisional Forest Officer, in Bardhaman division.



# 4 Geomorphology

# 4.1 General Landforms

Barddhaman district with its varied tectonic elements and riverine features, is a transitional zone between the Jharkhand plateau which constitutes a portion of peninsular shield in the west and Ganga-Brahamaputra alluvial plain in the north and east. In general the Jharkhand plateau consists of the metasedimentary rocks of precambrian age, Gondwana sedimentary rocks, Rajmahal basalts and upper tertiary sediments. Laterite has developed on these older rocks as well as on early Quaternary sediments. Towards south, the alluvial plain merges with Damodar-kasain-Subarnarekha deltaic plains.

The western half of the district resembles a promontory jutting out from the hill ranges of Chotonagpur plateau and consists of barren, rocky and rolling country with a laterite soil rising into rocky hillocks, the highest being 227 m. These diversify the otherwise monotonous landscape and lend a special charm to the skyline arround Asansol subdivision.

Ajay-barakar divide is a convex plateau, the avarage altitude being 150 m. The gradient is westerly to the west and to the east it is northerly towards Ajay and southerly towards Damodar below the latitude. The Ajay- Damodar inter-stream tract is made up of several stows consisting of vales and low convex spurs which run in almost all directions except north-east and thus lends a very complicated character to local relief.

# 4.2 Soil and rock pattern

Different types of soil are encountered in different topographical biological and hydrological as well as geological condition within the Barddhaman district. In the west coarse gritty soil blended with rock fragments is formed from the weathering of pegmatites, quartz veins and conglomeratic sandstones, where as sandy soil characteristic of granitic rocks and sandstones. This soil is of reddish colour, medium to coarse in texture, acidic in reaction, low in nitrogen, calcium, phosphate and other plant nutrients. Water holding capacity of this soil increases with depth as well as with the increase of clay portions. Towards the east alluvial soil attains an enormous thickness in the low level plains to the east. This alluvial soil is formed of alluvium brought down by the Ajay, Damodar, Bhagirathi and numerous other rivers. These soils are sandy, well drained and slightly acidic in nature.

Depending upon the soil Bardhaman district is divided into three separated zones:i. Gangetic soil, which is found along the Ganga River.

ii. Vindhyan soil, between Ajay and Damodar Rivers in the central and eastern parts.

iii. Red soils, occurring in the undulgating and coal field areas in the western parts of the district.

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	Soil Type
Woo6	Very deep, poorly drained, fine cracking soils occuring on level to	Fine, Vertic Ochraqualfs
11030	associated with very deep, imperfectly drained, fine soils	Fine, Typic Ustochrepts
Wooz	Very deep, poorly drained, fine soils occuring on level to nearly	Fine, Typic Haplaquepts
1037	very deep, imperfectly drained, fine soils	Fine, Typic Ustochrepts
Woo8	Very deep, very poorly drained, fine cracking soils occuring on lovel to nearly lovel low bring alluvial plains with clavey surface	Very Fine, Vertic Haplaquepts
11030	associated with very deep, poorly drained, fine soils	Fine, Typic Haplaquepts
Wooo	Very deep, imperfectly drained, fine soils occuring on level to nearly level low lying alluvial plains with clayey surface	Fine, Typic Ustochrepts
1039	associated with very deep, moderately well drained, coarse loamy soils	Coarse loamy, Typic Ustifluvents
Woa	Very deep, poorly drained, fine cracking soils occuring on level to poorly lovel low lying alluvial plains with learny surface	Fine, Vertic Ochraqualfs
11040	associated with very deep, poorly drained, fine soils	Fine, Aeric Haplaquepts
Woat	Very deep, poorly drained, fine cracking soils occuring on level	Fine, Vertic Haplaquepts
11041	associated with very deep, poorly drained, fine soils	Fine, Typic Haplaquepts
W042	Very deep, poorly drained, fine soils occuring on level to nearly level low bying alluvial plains with clavey surface associated with	Fine, Aeric Haplaquepts
11042	very deep, imperfectly drained, fine cracking soils	Fine, Vertic Ochraqualfs
Woap	Very deep, poorly drained, fine soils occuring on very gently doping low bring alluvial plain with learny surface associated	Fine, Typic Ochraqualfs
11043	with very deep, poorly drained, fine creacking soils	Fine, Vertic Ochraqualfs
W046	Very deep, poorly drained, fine soils occuring on very gently sloping low lying alluvial plain with clayey surface and	Fine, Typic Haplaquepts
11040	moderately flooding associated with very deep, poorly drained, fine loamy soils	Fine, Typic Ustochrepts
Wear	Very deep, poorly drained, fine soils occuring on level to nearly level low lying alluvial plain with clayey surface and severely	Very Fine, Aeric Haplaquepts
w047	flooding associated with very deep, moderately well drained, fine loamy soils	Fine loamy, Typic Ustochrepts
W060	Very deep, moderately well drained, coarse loamy soils occuring on level to nearly level meander plain with loamy surface and	Coarse loamy, Typic Fluvaquents



Code	Description	Soil Type
	moderate flooding associated with very deep, imperfectly drained, fine loamy soils	Fine loamy, Typic Ustochrepts
W061	Very deep, moderately well drained, coarse loamy soils occuring on level to nearly level meander plain with loamy surface and	Coarse loamy, Typic Ustifluvents
W001	moderate flooding associated with very deep, poorly drained, fine soils	Fine, Aeric Haplaquepts
Wo64	Very deep, moderately well drained, coarse loamy soils occuring on very gently sloping flood plain with loamy surface,moderate	Coarse loamy, Typic Ustifluvents
w004	erosion and moderate flooding associated with very deep, moderately well drained, fine loamy soils	Fine loamy, Typic Ustifluvents
	Very deep, moderately well drained, fine loamy soils occuring on very gently sloping flood plain with loamy surface,moderate	Fine loamy, Typic Ustifluvents
W065	erosion and moderate flooding associated with very deep, well drained, sandy soils	Typic Ustifluvents
Mode	Very deep, imperfectly drained, coarse loamy soils occuring on very gently sloping to undulating dissected upland with loamy	Coarse loamy, Typic Haplaquepts
w00/	surface and moderate erosion associated with very deep, moderately well drained, fine loamy soils	Fine loamy, Typic Haplaquepts
Wo69	Very deep, imperfectly drained, fine loamy soils occuring on very gently sloping to undulating dissected upland with loamy	Fine loamy, Ultic Paleaustalfs
W068	surface and moderate erosion associated with very deep, moderately well drained, fine loamy soils	Fine loamy, Rhodic Paleaustalfs





#### Figure 4.1: Soil Map of the District

(<u>https://esdac.jrc.ec.europa.eu/content/west-bengal-soils-sheet-2</u>)



# 4.3 Different geomorphologic units

**Purba Bardhaman district is a flat alluvial plain area** that can be divided into four prominent topographical regions. On the north, the Kanksa Ketugram Plain lies along the Ajay, which joins the Bhagirathi. The Bardhaman Plain occupies the central area of the district, with the Damodar on the south and the south-east. On the southern part is the Khandaghosh Plain. The Bhagirathi flows along the eastern boundary of the district, and the Bhagirathi Basin occupies the eastern part of the district. The undulating laterite topography of Paschim Bardhaman district extends up to Ausgram area of this district.



**Figure 4.2: Geomorphological map of the District** (*Resourcesat-1and2 – Liss-3, Bhuvan India*)





# 5 Land use pattern of the district

Table 5.1 gives land utilization static of Purba 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.

		-		(In thou	<u>isand hectar</u> e
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

# Table 5.1: Classification of Land Utilisation Statistics in the district

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



Figure 5.1: Land use pattern of Purba Bardhaman District





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



# a) Forest

**The Ramnabagan Wildlife Sanctuary** was declared as a reserved forest in the year 1960 and is known for its abundance of chital and barking deer. The Ramnabagan Mini Zoo is a part of the wildlife sanctuary and spreads over an area of 14.31 hectares in the area of Mouza Baburbag in Bardhaman. This is under the control of Divisional Forest Officer, in Bardhaman division.

The Ramnabagn Wildlife sanctuary has a wide variety of animals and birds like spotted deer, leopard, sloth bear, crocodile, peafowl, adjutant stork, rosy pelican and blackbuck, which are a recent inclusion. Common langurs are abundant in the zoo area. Few other birds like the parakeets, cuckoos, storks, snakes, mongooses, owls, spotted dove martins thrive in a remarkable habitat in this sanctuary cum mini zoo area. The Ramna garden forest has tall stately teak trees and Sal forests with a variety of plants like Kadbels, Dumur, Jam, etc.

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

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



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)

## b) Agriculture and Irrigation

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 sources of irrigation in the district are canals, tanks, open wells, bore-wells; lift irrigation schemes, micro irrigation practices etc.

					(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

## Table 5.3: Production of Principal Crops in the district of Purba Bardhaman

#### District Survey Report Purba Bardhaman District, West Bengal



2.	Wheat	2443	2193	2413	2864	2691
3.	Barley	-	-	980	997	988
4.	Maize	2152	2080	2091	2097	2091
5.	Other Cereals	-	-	-	-	-
Total Cereals	5	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
<b>Total Pulses</b>		759	<b>99</b> 7	1094	1027	984
Total		3042	2947	2939	3228	3324
Oil Seeds :	Ι					
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		901	951	955	1163	1041
Fibres * :	Ι					
1.	Jute	17.2	21.1	18.3	15.5	21.2
2.	Mesta	11.6	0.2		10 <b>-</b>	
0			0.3	0.9	12.5	13.2
3.	Other Fibres	3.0	7.8	0.9 5.0	12.5 5.1	13.2 5.0
5. Total Fibres	Other Fibres	3.0 <b>17.1</b>	7.8 20.8	0.9 5.0 <b>18.3</b>	12.5 5.1 <b>15.48</b>	13.2 5.0 <b>21</b>
3. Total Fibres Miscellaneou	Other Fibres	3.0 <b>17.1</b>	7.8 20.8	0.9 5.0 <b>18.3</b>	12.5 5.1 <b>15.48</b>	13.2 5.0 <b>21</b>
5. Total Fibres Miscellaneou 1.	Other Fibres	3.0 <b>17.1</b> 80830	7.8 <b>20.8</b> 95064	0.9 5.0 <b>18.3</b> 45180	12.5 5.1 <b>15.48</b> 45524	13.2 5.0 <b>21</b> 64403
5. Total Fibres Miscellaneou 1. 2.	Other Fibres Other Fibres Sugarcane Potato	3.0 <b>17.1</b> 80830 41117	7.8 20.8 95064 37645	0.9 5.0 <b>18.3</b> 45180 27675	12.5 5.1 <b>15.48</b> 45524 32578	13.2 5.0 <b>21</b> 64403 22336
3. <b>Total</b> <b>Fibres</b> <b>Miscellaneou</b> 1. 2. 3.	Other Fibres	3.0 <b>17.1</b> 80830 41117 -	7.8 20.8 95064 37645 -	0.9 5.0 <b>18.3</b> 45180 27675 -	12.5 5.1 <b>15.48</b> 45524 32578 -	13.2 5.0 <b>21</b> 64403 22336 -
3. Total Fibres Miscellaneou 1. 2. 3. 4.	Other Fibres	3.0 <b>17.1</b> 80830 41117 - -	7.8 20.8 95064 37645 - -	0.9 5.0 <b>18.3</b> 45180 27675 - -	12.5 5.1 <b>15.48</b> 45524 32578 - -	13.2 5.0 <b>21</b> 64403 22336 - -
<ul> <li>J.</li> &lt;</ul>	Other Fibres <b>IS crops :</b> Sugarcane Potato Tobacco Tea Chillies (dry)	3.0 <b>17.1</b> 80830 41117 - - 1498	7.8 20.8 95064 37645 - - 1501	0.9 5.0 <b>18.3</b> 45180 27675 - - - 1542	12.5 5.1 <b>15.48</b> 45524 32578 - - - 1461	13.2 5.0 <b>21</b> 64403 22336 - - - 1466
3. <b>Total</b> <b>Fibres</b> <b>Miscellaneou</b> 1. 2. 3. 4. 5. 6.	Other Fibres Sugarcane Potato Tobacco Tea Chillies (dry) Ginger	3.0 <b>17.1</b> 80830 41117 - 1498 1910	7.8 20.8 95064 37645 - - 1501 1910	0.9 5.0 <b>18.3</b> 45180 27675 - - 1542 1901	12.5 5.1 <b>15.48</b> 45524 32578 - - 1461 1994	13.2 5.0 <b>21</b> 64403 22336 - - 1466 1944

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

# c) 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.

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

#### Table 5.4: Production of Fruits in the district

(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

Nama of Flouron	Production						
Name of Flower	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)

# d) Mining

At the time of bifurcation of Bardhaman district in 2017, the mining and industrial areas of the district were placed in Paschim Bardhaman district and the Purba Bardhaman district was composed of rural/ agricultural areas.

Sand mining from river bed is most popular in Purba Bardhaman district.



# 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.ctrlstate=lekbxmwix\_5

Lithology	Geologic Unit		Age
Sand, Silt, Clay	Diara Formation		Upper Holocene to Recent
Clay Alternating with Silt and Sand	Paskura Formation	Quaternary	Middle to Upper Holocene
Clay with Caliche Aoncretion	Sijua Formation		Upper Pleistocene to Middle Holocene
Laterite	Laterite		Cainozoic
Very Coarse Sandstone	Durgapur Bed		Jurassic
Red Shale, Sandstone	Panchet Formation		Triassic
Fine Grained Sandstone, Siltstone with Coal Seams	Raniganj Formation	Condwana	Permian
Micaceous Shale, Sandstone	Barren Measure Formation	Super	Permian
Gritty Pebbly Sandstone with Coal Seams	Barakar Formation	Group	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.ctrlstate=lekbxmwix\_5)



# **PART A: RIVERBED DEPOSITS**



# 7 Mineral wealth

#### 7.1 Overview of mineral resources:

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

#### 7.2 Details of Sand and other riverbed minerals Resources:

The mineral resources of the district whose categorization and estimation have been done are furnished in this section.

#### I. Drainage

The river system in Bardhaman includes the Bhagirathi-Hooghly in the east, the Ajay and its tributaries in the north and the Dwarakeswar, the Damodar and its branches in the south-west. Besides, there are innumerable Khals and old riverbeds all over the area.

On the north, the Kanksa Ketugram Plain lies along the Ajay, which joins the Bhagirathi. The Bardhaman Plain occupies the central area of the district, with the Damodar on the south and the south-east. The Bhagirathi flows along the eastern boundary of the district, and the Bhagirathi Basin occupies the eastern part of the district. The notable rivers and khals are Damodar, Bhagirathi, Barakar, Ajay, Dwarakeswar, Nonia, Singaram, Tamla, Kukua, Kunur, Tumuni, Khari, Banka, Chanda-kanki nala, Behula, Gangur, Brahmani, Khandesvari, Karulia nala, Dwaraka or Babla, Koiya nala, Kandarkahal, Kanadamodar, Kananadi, Ghea, Kakinadi etc.

#### **Ajay River**

Ajay River originates from Batpar from Chakai block of Jamui district in Bihar. It then enters Jharkhand near Devipur (a proposed industrial area of Deoghar) and flows through Jharkhand and enters West Bengal at Simjuri, near Chittaranjan. It first forms the border between Paschim Bardhaman district and Jharkhand and then between Paschim Bardhaman district and Birbhum district, and finally it enters Katwa subdivision of Purba Bardhaman district at Nareng village in Ketugram police station. It then joins the Bhagirathi River at Katwa Town. Total length of the Ajay is 288 kilometres (179 mi), out of which 152 kilometres (94 mi) are in West Bengal. The catchment area of Ajay River is 6,000 square kilometres (2,300 sq mi).

#### **Damodar River**

The city of Bardhaman is situated on the banks of the river Damodar and acts as an anchor for this town. The river is considered to be a holy and sacred river by the aborigines of the Chotanagpur Plateau. The river Damodar originates from the Sonajuria Falls of the Bijonsa Hill which is located in the district of Palampur in Bihar. The river joins Barakar at the town of Dishergarh in the Asansol subdivision of the Bardhaman district and then flows through the rest of the district of Bardhaman. It continues to flow through the districts of Hooghly and Howrah in West Bengal before finally joining the Bhagirathi River, which is the other name for the Ganges in Murshidabad. Bardhaman takes up the shape of a delta along with the branch rivers



of the Damodar surrounding it, namely Balluka, Behula, Gangur, Banka and so on, some of which have almost become extinct at present. The civilization of 'Rarh-Bangla' has also developed with this river as its centre. A bridge has been constructed over the River Damodar at Sadarghat which is known as 'Krishok Setu' (as pronounced in Bangla).

#### **Hoogly River**

Bhagirathi River, river in West Bengal state, northeastern India, forming the western boundary of the Ganges-Brahmaputra delta. A distributary of the Ganges (Ganga) River, it leaves that river just northeast of Jangipur, flows south, and joins the Jalangi at Nabadwip to form the Hoogly River after a total course of 120 miles (190 km). Until the 16th century, when the Ganges shifted eastward to the Padma, the Bhagirathi formed the original bed of the Ganges. The Bhagirathi River originally flowed down the west of Nabadwip in the past, forming a natural boundary between the districts of Purba Bardhaman and Nadia. With time it has shifted its course to where it is at present, cutting the city off from the rest of the Nadia district.

#### Dwarakeswar River

Dwarakeswar River (also known as Dhalkisor) is a major river in the western part of the Indian state of West Bengal. The river originates near Madhabpur in Purulia district and enters Bankura district near Chhatna. It cuts across the district flowing past the district headquarters and enters the southeastern tip of East Bardhaman District. It then passes through Hooghly District. The Silai joins it near Ghatal and the two together are known as Rupnarayan River, which flows into the Hooghly River near Gadiara in Howrah District. Dwarakeswar River has much sedimentation from low water (any season). In rainy seasons it is filled up with water; then huge sedimentations are blocked the channel, even near Arambagh the channel basin reduced by garbage and anthropogenic (man made).

#### a) Drainage System with description of main rivers

Table 7:1: Dramage system with description of main rivers						
Sl.No.	Name of the River	Area drained (Sq.km)				
1	Damodar	100049200.5970				
2	Dwarakeswar	3340571.5927				
3	Ajay	22159459.9255				
4	Hoogly	48107612.6196				

# Table 7.1: Drainage system with description of main rivers

#### b) Salient Features of important rivers and streams

#### Table.7.2: Salient Features of important rivers and streams

S.No.	Name of the River or Stream	Total Length in District (in Km)	Place of origin	Altitude at Origin
1	Damodar	98,911.49	ChulhaPani, Lohardaga district, Chota Nagpur Plateau, Jharkhand	2000.49 ft
				Page 52



S.No.	Name of the River or Stream	Total Length in District (in Km)	Place of origin	Altitude at Origin
2	Dwarakeswar	10,486.62	Tilaboni hills of Madhavpur village, Purulia	1000 ft
3	Ajay	90,463.61	Chakai block of Jamui, Bihar	980 ft
4	Hoogly	1,21,945.16	Giria, Murshidabad	12769 ft

#### 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 river is foremost factor for annual deposition of sedimentary load. The study includes following parameter:

#### i) Place of Origin

Details of origin of rivers of Purba Bardhaman District are furnished in Table 7.3.

S.No.	Name of the River or Stream	Place of origin	
		ChulhaPani, Lohardaga	
1	Damodar	district, Chota Nagpur	
		Plateau, Jharkhand	
0	Duranalzaguran	Tilaboni hills of Madhavpur	
2	Dwarakeswar	village, Purulia	
3	Ajay	Chakai block of Jamui, Bihar	
4	Hoogly	Giria, Murshidabad	

Table 7.3: Place of Origin of important rivers and streams

#### ii) Catchment Area

The Purba Bardhaman district is mainly drained by the Damodar, Dwarakeswar, Hoogly and Ajay. These rivers and its tributary rivers are forming the main catchment area.

## iii) General profile of river stream

River profile has been studied along the cross-section lines which was chosen based on the drastic variation of the river widths, proximity of the operating sand 'ghats' and the position of the sand bars.

Relative disposition of rivers in Purba Bardhaman district along with the distribution of the section lines are shown in Figure 7.1. River profile section and cross section views are presented in Figures 7.2 and 7.3.




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



Figure 7.2A: Profile section of Damodar River



Figure 7.2B: Profile section of Dwarakeswar 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  $4\Phi$  or  $62.5 \mu$ m. 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 sedimenttransport 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 period. With systematic data acquisition, a model has 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.

## A. Replenishment estimation based on satellite imagery study

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 is done using Ackers and White Equation.

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

#### • Field data collation:

Field data collations were done during June 2020 for pre monsoon period and during December 2020 for post monsoon period for the river ghats on continuous basis. Figure 7.3 shows the site view of Dwarakeswar River. However, the non-operational 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 assess their particle size distribution.





Figure 7.3: Site View of River Dwarakeswar (Monsoon 2020)

• 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.

#### • 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.
- > Extent of the sand bars are measured from the pre monsoon satellite imagery.
- Sand production data of the district.

#### • 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 extent of the catchment areas, which crosses the district and state boundaries.

#### • Estimation of annual sand deposition:

The major sand producing rivers of Purba Bardhaman district are Damodar, Dwarakeswar, Ajay and Hoogly Rivers. Planning has been done for systematic sand mining in the rivers.



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 periods for different rivers Purba 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 period are provided in Annexure-2. Maps showing distribution of sand bars on rivers of the the district during pre- and post-monsoon periods are depicted in Plate-2A and 2B respectively.

# Table 7.4: Sediment Load comparison between Pre- and Post-monsoon periods fordifferent rivers

River Name	Pre-Monsoon Sediment Load (MCum)	Post Monsoon Sediment Load (MCum)	Variance (MCum)	Variance (%)
Ajay	10.5	14.4	3.9	37%
Hoogly	0.52	0	-0.5	-100%
Damodar	74.79	79.7	4.9	7%
Dwarakeswar	3.5	2.9	-0.6	-18%
Total	89.31	96.91	7.60	9%

About 7.60 million cum of sand has been found as an incremental volume increase when compared between pre- and post-monsoon sand reserve data. Percentage difference is about 109% which is replenishment and aggradation rate for the year.

Long-term satellite imagery study has also been carried out for sand producing rivers of Purba Bardhaman district to analyse the changes in river course. A representative map, showing long-term erosion-accretion areas on both the banks of Ajay River, Purba Bardhaman has been prepared and furnished in Plate No. 5.

#### 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 differences between the depths 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.

			,	<u> </u>							
River Name	Location (Mauza)	Area	Surface RL	Thick ness	Volume	After mining floor RL	Surface RL after Replenish ment	Thick ness Reple nished	Volume Reple nished	Diffe rence in RL	Reple nish ment Rate
		m2	m	m	cum	m	m	m	cum	m	%
Ajay	Malcha	19800.00	43.00	2.90	57420.00	40.10	42.94	2.84	56271.60	0.06	98.00%
Ajay	Harinathpur	28700.00	42.00	2.95	84665.00	39.05	41.94	2.89	82802.37	0.06	97.80%
Ajay	Churpuni	39600.00	17.00	3.00	118800.00	14.00	16.93	2.93	115948.80	0.07	97.60%
Damodar	Naricha	15100.00	34.00	2.88	43488.00	31.12	33.93	2.81	42357.31	0.07	97.40%
Damodar	Bangpur	27100.00	23.00	2.90	78590.00	20.10	22.94	2.84	77018.20	0.06	98.00%
Damodar	Jafrabad	20200.00	20.00	2.94	59388.00	17.06	19.96	2.90	58497.18	0.04	98.50%

#### Table 7.5: Replenishment rate of the district

Based on field investigation, the average replenishment rate for the year 2020 is about 97.88%.

#### C. Replenishment estimation based on a 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.





Figure 7.4: Watershed map of Purba Bardhaman district

Catchment Yield can be estimated using following formula:

#### Catchment Yield (m<sup>3</sup>) =Catchment area (m<sup>2</sup>) × Runoff coefficient (%)×Rainfall (m)

The runoff generated from the watershed is analyzed using Strange's Table 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 Strange's Table.

Strange (1892) studied the available rainfall and runoff and obtained yield ratios as functions of indicators representing catchment characleristics (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 Strange established runoff coefficient table as givennin Table 7.6.



Total	Runoff coefficient (%)			Total	Ru	noff coefficient	: (%)
monsoon rainfall (mm)	Good catchment	Average catchment	Bad catchment	monsoon rainfall (mm)	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

Rainfalls 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),

 $\mathbf{Q} = \mathbf{C}\mathbf{A}^{3/4}$ 

Where: Q is Maximum flood discharge (m<sup>3</sup>/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),

 $\mathbf{Q} = \mathbf{C}\mathbf{A}^{1/2}$ 

Where: Q is Maximum flood discharge (m3/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.

$$C_{t} = C_{s}G_{s} (d_{50}/h) (V/U_{*}) n' [(Fgr/A_{1}) - 1] m$$



The dimensionless particle d<sub>gr</sub> is calculated by:

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

The particle mobility factor F<sub>gr</sub>is calculated by:

$$_{\rm Fgr}=(U\times n'/({\rm Gs-1})g~d_{50})^{1/2}\times (V/(5.66\log(10h/d_{50}))^{1-n'})$$

Where,

- $A_1$  = Critical particle mobilityfactor
- *C*<sub>s</sub> = Concentration coefficient in the sediment transportfunction
- $C_t$  = Total sediment concentration
- $d_{50}$  = Median grainsize
- $d_{gr}$  = Dimensionless particle diameter
- $F_{gr}$  = Particle mobilityparameter
- *g* = Acceleration of gravity
- $D_s, S_g$  = Specific gravity
- *h* = Waterdepth
- *m* = Exponent in the sediment transportfunction
- n' = Manning roughness coefficient
- $U_*$  = Shear velocity
- *V* = Mean flowvelocity
- $\nu$  = Kinematic viscosity

#### **Meyer – Peter's equation (Source: Hydrologic Engineering Center):**

Meyer-Peter's equation (Ponce, 1989) is based on experimental work carried out at the Federal Institute of Technology, Zurich. Mayer-Peter gave a dimensionless equation based on rational laws. Mayer- Peter equation 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.

 $\eta'$  = Manning's coefficient pertaining to grain size on an unrippled bed and Strickler formula i.e.  $\eta' = (1/24) \times d1/6$  where d is the median size (d<sub>50</sub>) of the bed sediment in m.

 $\eta$  = 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.

 $\tau c$  = Critical shear stress required to move the grain in N/m2 and given by equation $\tau c$  = 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<sub>50</sub> and d<sub>60</sub>.

 $\tau o$ = Unit tractive force produced by flowing water i.e. $\gamma wRS$ . Truly speaking, its value should be taken as the unit tractive force produced by the flowing water on bed = 0.97 $\gamma wRS$ . 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 occurs 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 hydraulic 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 transport 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 erosion 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× (Q) <sup>0.46</sup>× [1.43-0.26 Log (A)]

#### For run off more than 2 inches:

 $(Q > 2 \text{ in}): S= 1958 \times (e^{-0.055} \times Q) \times [1.43-0.26 \text{ Log} (A)]$ 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 sediment 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 for preliminary watershed planning. Computed sediment yields normally would be low for highly erosive areas and high for well stabilized drainage basins with high vegitation 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 slope usually decreases; and there is less probability of an intense rainstorm over the entire basin. Both phenomena tend to 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. 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 rainfall 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 rainfall.

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 ofrunoff 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:

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

Where,

Y = sediment yield of stream (t/yr/km2), O = average annual runoff (m3).

K = soil erodibility factor,

 $qP = Highest discharge recorded (m_3/s),$ 

Ls = gradient/slope length,

C = cover management factor,

P = erosion control practice

#### ii. Estimation of Replenishment:

Purba Bardhaman district is mainly drained by the Damador, Dwarakeswar, Ajay and Hoogly 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 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 sediment yield from individual drainage basin may vary 10-fold or even 100-fold from computed yields. Since the district river basins comprise sedimentary rocks with good average rainfall therefore the estimated replenishment is 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

<b>Estimation parameter</b>	Damodar	Ajay
Catchment Area (m²)	1037800000	1197000000
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 (m³)	665063752	767085480
Peak Flood Discharge (m³/sec)	69385144.30	77223922.77
Flow depth d (m)	1.6	1.2
<b>Channel width b</b> (m)	655	240
<b>Mean velocity v</b> (m/s)	0.06	0.05
<b>Channel slope S</b> $_{o}$ (m/m)	0.001	0.001
Sediment Yield (Tons/year)	21666.01	25544.31
Estimated Annual Replenishment (in million m3)	0.57016	0.67222

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 7.5.

			,
Year	Damodar	Ajay	Annual Rainfall
2016	24.61	26.46	1408.4
2017	14.03	17.24	1668
2018	51.48	43.36	1000.8
2019	33.55	23.9	1213.2
2020	21.08	22.55	1479.8

#### Table 7.8: Year-wise sedimentation rate for last 5 years of each river





#### Figure 7.5: 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.

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	Malcha	19800.00	43.00	2.90	57420.00		40194.00	70.00%
Ajay	Harinathpur	28700.00	42.00	2.95	84665.00		61382.13	72.50%
Ajay	Churpuni	39600.00	17.00	3.00	118800.00	1.49	86724.00	73.00%
Damodar	Naricha	15100.00	34.00	2.88	43488.00	1.40	32616.00	75.00%
Damodar	Bangpur	27100.00	23.00	2.90	78590.00		60907.25	77.50%
Damodar	Jafrabad	20200.00	20.00	2.94	59388.00		45134.88	76.00%

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

Illustration of Replenishment Estimation is given in Table 7.10.



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

Based on Satellite imageries		Based on field in	vestigation	Based on empirical formula		
Particulars	Estimation	Particulars	Estimation	Particulars	Estimation	
		River Name	Ajay	River Name	Ajay	
River	Ajay	Location	Harinathpur	Location	Harinathpur	
Total Premonsoon Sand Bar Area	21402205.97 (sq.m)	Mining Area	28700 (Sq.m)	Lease Area	28700 (Sq.m)	
Average Pre monsoon Thickness	2.8 (m)	Pre monsoon RL	42 (m)	Surface RL Before mining	42 (m)	
Total Volume	5.51 (Mcum)	Sand Thickness	2.95 (m)	Mine out Thickness	2.95 (m)	
Total Postmonsoon Sand Bar Area	22044530.76 (sq.m)	Volume excavated (Cum)	84665.00 (Cum)	Mine out Volume (Cum)	84665.00 (Cum)	
Average Postmonsoon Thickness	3 (m)	Post monsoon RL	41.94 (m)	Drainage area for lease block	0.078 (Sq.km)	
Total Volume	7.62 (M.cum)	Thickness	2.89 (m)	Monsoon Rainfall-2020	1.48 (m)	
Total Pre and Post monsoon Volume Difference	2.10 (M.cum)	Volume deposited (Cum)	82802.37 (Cum)	Estimated Volume as per Dendy- Bolton (S = 1280 Q0.46[1.43 - 0.26 log(A)]) Where, Q is runoff, A is drainage area)	61382.13 (Cum)	
Replenishment and Agreedation %	138%	Replenishment Rate	97.80%	Replenishment Rate	72.5%	

Replenishment studies have been carried out in the district based on three different methodologies as illustrated in Table 7.10. Table 7.11 explained comparison of the outcome of these three methodologies adopted for the district.

#### **Comparison of replenishment study**

Replenishment Study Method	Damodar	Ajay
Estimated Annual Replenishment based on Sattelite imegaries ( * )	107%	137%
Estimated Annual Replenishment based on field investigation	97.97%	97.80%
Estimated Annual Replenishment based on empirical formula	76.17%	71.83%

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

#### vi) Total potential of minor mineral in the river bed

The major sand producing rivers of the Purba Bardhaman district are Damodar, Dwarakeswar, Ajay and Hoogly 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 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.

#### ii) Tectonics and structural behavior of rocks

The Ajay-Damodar Interfluve region is a complex zone in eastern India. The interfluve region is characterized by active tectonic actions with number of active sub-surface faults in different direction. The main complex boundary fault with Gondwana rocks exists in the south of the Ajoy river. The northern boundary is affected by oblique faults which has been complicated by a number of cross faults. South of the Damodar River, a second main boundary fault, called the panchet hill.

#### **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

The 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



The 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 are pleasant and enjoyable, with mercury dropping to about 14°C or below. Winter starts from December and last till the month of February.

#### **Annual Deposition:**

Annual deposition of riverbed minerals has been calculated on post-monsoon sand volume. The pre-monsoon sand volume of the river is the depleted resource and is replenished by the monsoon rainfall. For estimating mineable mineral potential, the thickness of the sand bar considered extractable based on base flow level is given in Table 7.11.

<b>River Name</b>	Considered Mining Thickness (m)
Damodar	2.70
Dwarakeswar	3.00
Ajay	3.00
Hoogly	2.50

#### Table 7.11: River wise Thickness of sand bar considered mineable

Based on geomorphology, geology, climate and mineable thickness of sand bar the annual deposition of riverbed minerals 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 <sup>1</sup>/<sub>4</sub>th 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.

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	17%	42,600.54	295.55	3744763.61	6.74
2	Damodar	31%	64,911.42	894.37	30697268.68	49.73
3	Dwarakeswar	32%	7,442.00	430.40	1059394.40	1.91
						58.38



## III. Riverbed Mineral Potential Process of disposition etc:

**Sand:** Huge quantities of quality sands are found to occur in part of rivers. Smaller patches are also available locally in the other smaller rivers as well. Table 7.13 summarizes the potential riverbed mineral deposits of the district.

Table 7.13: Resources of Potential Riverbed Mineral										
Boulder (Mcum)	Pebbles/Gravel (Mcum)	Sand/White sand (Mcum)	Total Mineable, Mineral Potential (Mcum)							
-	-	58.38	58.38							

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.

				COOR	DINATE	Area within
Sl.No	Rivers or Streams	Administrative Block	ZONE	LATITUDE	LONGITUDE	promitted zone as per rule 3 of WBMMC Rules, 2016 (in sq.m)
		MANGOLKOTE	AJ ZONE 1	23° 34' 36.112" N 23° 37' 46.086" N	<u>87° 55' 56.479" Е</u> 87° 57' 37.537" Е	87760.20549
		KETUGRAM 1	AJ ZONE 2	23° 37' 44.645" N 23° 37' 51.240" N	<u>87° 57' 23.193" Е</u> 87° 58' 34.969" Е	96697.80885
		MANGOLKOTE	AJ ZONE 3	23° 37' 51.240" N 23° 38' 6.042" N	87° 58' 34.969" E 87° 58' 46.859" E	5256.421056
		KETUGRAM 1	AJ ZONE 4	23° 38' 8.476" N 23° 38' 16.954" N	87° 58' 49.793" E 88° 0' 26.401" E	128944.7216
		MANGOLKOTE	AJ ZONE 5	23° 37' 55.012" N 23° 38' 3.821" N	87° 59' 41.498" E 88° 0' 1.220" E	9485.359898
		KETUGRAM 2	AJ ZONE 6	23° 38' 14.507" N 23° 38' 2.268" N	88° 0' 40.995" E 88° 2' 18.285" E	119162.9941
		MANGOLKOTE	AJ ZONE 7	23° 38' 6.904" N 23° 38' 2.268" N	88° 2' 23.941" E 88° 2' 18.285" E	10307.63064
		KETUGRAM 2	AJ ZONE 9	23° 38' 15.655" N 23° 38' 43.144" N	88° 2' 27.733" E 88° 3' 27.426" E	6560.450667
		KATWA 1	AJ ZONE 11	23° 39' 1.879" N 23° 39' 37.895" N	88° 4' 54.787" E 88° 5' 6.620" E	59554.98772
1	AJAY	KETUGRAM 2	AJ ZONE 12	23° 39' 49.660" N 23° 39' 37.479" N	88° 5' 26.814" E 88° 5' 31.859" E	15716.78694
		KATWA 1	AJ ZONE 13	23° 39' 44.386" N 23° 39' 36.815" N	88° 5' 28.194" E 88° 5' 30.476" E	12109.45769
		MANGOLKOTE	AJ ZONE 14	23° 34' 17.838" N 23° 33' 18.808" N	87° 55' 30.791" E 87° 54' 42.199" E	1327.116441
		MANGOLKOTE	AJ ZONE 15	23° 32' 44.796" N 23° 33' 20.699" N	87° 53' 42.684" E 87° 52' 19.826" E	2157.940975
		MANGOLKOTE	AJ ZONE 16	23° 33' 12.123" N 23° 34' 7.513" N	87° 50' 42.012" E 87° 50' 11.000" E	0
		MANGOLKOTE	AJ ZONE 17	23° 33' 58.967" N 23° 33' 43.046" N	87° 49' 13.333" E 87° 48' 39.093" E	54286.94664
		MANGOLKOTE	AJ ZONE 18	23° 34' 4.824" N 23° 34' 17.984" N	87° 47' 53.103" E 87° 47' 39.624" E	59707.51149
		MANGOLKOTE	AJ ZONE 19	23° 34' 54.460" N 23° 34' 46.443" N	87° 46' 59.546" E 87° 46' 18.259" E	3516.473642
		MANGOLKOTE	AJ ZONE 20	23° 34' 56.432" N 23° 35' 35.027" N	87° 45' 52.807" E 87° 44' 37.477" E	10724.87081
		AUSGRAM 2	AJ ZONE 21	23° 35' 27.275" N	87° 43' 55.466" E	42679.7351

#### Table 7.14: Potential Zone of Riverbed Mineral



				COORI	DINATE	Area within	
Sl.No	<b>Rivers or Streams</b>	Administrative Block	ZONE	LATITUDE	LONGITUDE	per rule 3 of WBMMC Rules, 2016 (in sq.m)	
				23° 37' 0.639" N	87° 42' 23.594" E	· • ·	
		AUSGRAM 2	AJ ZONE 22	23° 37' 4.616" N	87° 40' 47.084" E	31990.35103	
				23° 36 57.919 N	87° 39 46.786 E	0,,, 00, 0	
		AUSGRAM 2	AJ ZONE 23	23° 36' 17.856 N 23° 36' 15.214" N	87° 37' 13.039" E	43536.68263	
		AUSGRAM 3 AJ ZONE 23		23° 35' 46.269" N	87° 35' 39.343" E	78560.84652	
		0		23° 36' 5.401" N	87° 36' 22.246" E	, -0 1-0	
l		AUSGRAM 2	AJ ZONE 24	23° 36 11.236 N	87° 33 55.078 E 87° 22' 7 062" E	38877.53588	
				23° 39' 18.847" N	88° 7' 6.466" E	_	
		KETUGRAM 2	AJ ZONE 25	23° 39' 33.507" N	88° 7' 9.919" E	19347.38557	
		CALSE	DA ZONE 1	23° 19' 16.284" N	87° 32' 19.702" E	77174 06040	
		GALSI I	DAZONEI	23° 18' 56.820" N	87° 32' 54.691" E	//1/4.30942	
		GALSI 2	DA ZONE 2	23° 15' 5.376" N	87° 37' 2.616" E	2480431.873	
			Diridonia	23° 14' 41.420" N	87° 46' 15.749" E	-4004911079	
		KHANDAGHOSH	DA ZONE 3	23° 14' 37.967" N	87° 45' 8.073" E	143637.9324	
			_	23° 13 54.047 N	87° 47 40.585 E		
		BARDHAMAN 1	DA ZONE 4	23° 12' 44.115" N	87° 50' 17.421" E	496554.1128	
2	DAMODAD	DIDDULINAN	DA ZONTE -	23° 12' 26.924" N	87° 51' 18.030" E	-(())	
2	DAMODAK	BARDHAMAN 2	DA ZONE 5	23° 9' 53.916" N	87° 58' 15.185" E	766143.4298	
		MEMADI 1	DA ZONE 6	23° 9' 53.916" N	87° 58' 15.185" E	95511 50 410	
		MEMAKI I	DAZONE 0	23° 8' 58.198" N	88° 0' 21.947" E	05511.53419	
		JAMALPUR	DA ZONE 7	23° 8' 59.024" N	88° 0' 33.226" E	_	
		originality out	DILDINE	23° 7' 4.648" N	87° 59' 16.032" E		
		RAINA 2	DA ZONE 8	23° 2' 6.839" N	87° 58' 28.848" E	-	
			DILLONLO	22° 56' 28.349" N	87° 56' 20.846" E		
		JAMALPUR	DA ZONE 9	23° 6' 8.302" N	87° 59' 53.875" E	-	
			,	23° 4' 37.841" N	87° 59' 22.928'' E		
		KHANDAGHOSH	DW ZONE 1	23° 0' 45.842" N	87° 42' 52.609" E	23772.3008	
3	DWARAKESWAR			22° 59 57.504° N	0/ 43 30.423 E		
		RAINA 2	DW ZONE 2	22° 59 8.774 N	87° 45' 52 870" F	63106.1474	

#### **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 Purba Bardhaman district is given in Figure 7.6. Table 7.15 summarized the area of no mining for each river of the district.

RIVER NAME	ZONE	RESTRICTED AREA (SQ MTS)
AJAY	AJ ZONE 1	87760.20549
RIVER	AJ ZONE 2	96697.80885
		P

#### Table 7.15: No mining zone in the district



RIVER NAME	ZONE	RESTRICTED AREA (SQ MTS)
	AJ ZONE 3	5256.421056
	AJ ZONE 4	128944.7216
	AJ ZONE 5	9485.359898
	AJ ZONE 6	119162.9941
	AJ ZONE 7	10307.63064
	AJ ZONE 8	6560.450667
	AJ ZONE 9	59554.98772
	AJ ZONE 10	15716.78694
	AJ ZONE 11	12109.45769
	AJ ZONE 12	1327.116441
	AJ ZONE 13	2157.940975
	AJ ZONE 14	0
	AJ ZONE 15	54286.94664
	AJ ZONE 16	59707.51149
	AJ ZONE 17	3516.473642
	AJ ZONE 18	10724.87081
	AJ ZONE 19	42679.7351
	AJ ZONE 20	31990.35103
	AJ ZONE 21	43536.68263
	AJ ZONE 22	78560.84652
	AJ ZONE 23	38877.53588
	AJ ZONE 24	19347.38557
	DA ZONE 1	77174.36942
	DA ZONE 2	2480431.873
	DA ZONE 3	143637.9324
DAMODAD	DA ZONE 4	496554.1128
DAMODAK	DA ZONE 5	766143.4298
KIVER	DA ZONE 6	85511.53419
	DA ZONE 7	-
	DA ZONE 8	-
	DA ZONE 9	-
DWARAKESWAR	DW ZONE 1	23772.3008
RIVER	DW ZONE 2	63106.1474



Figure 7.6: A representative map showing no-mining zone demarcated on Ajay River



# 8 Overview of mining activity in the district

## 8.1 General overview

In Purba Bardhaman district collection of sand from river-bed is one of the main minor mineral sources of the district. These materials are primarily utilized for construction purpose.

## 8.2 List of existing mining leases of the districts

Details of List of existing mining leases of the districts are furnished in Table 8.1.



	Table 8.1: Details of Sand mining leases of the districts											
Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE		
1	Prasenjit Mahattom	1103/SB2021	Ajay	Ausgram-II	Harinathpur	4	1(P)	23° 36' 27.67''N 87° 33' 31.10''E , 23° 36' 23.34''N 87° 33' 39.34''E , 23° 36' 22.17''N 87° 33' 38.76''E , 23° 36' 25.18''N 87° 33' 32.16''E	25,200	5-16-2018		
2	Somrith Enterprise	1093/SB2021	Ajay	Ausgram-II	Gerai	9	1893(P)	23° 51' 50.57''N 87° 33' 59.92''E, 23° 26' 37.46''N 87° 34' 24.58''E, 23° 26' 39.45''N 87° 34' 25.29''E, 23° 26' 40.21''N 87° 34' 25.32''E, 23° 26' 42.49''N 87° 34' 26.56''E, 23° 26' 43.19''N 87° 34' 27.41''E, 23° 26' 43.97''N 87° 34' 27.56''E, 23° 26' 43.77''N 87° 34' 29.89''E, 23° 26' 42.91''N 87° 34' 30.12''E, 23° 26' 58.85''N 87° 34' 26.92''E, 23° 26' 38.02''N 87° 34' 27.21''E	5,100	10-5-2018		
3	Dinanath Chawdhery	271/SB2021	Damodar	Bardhaman-I	Bangpur	32	1827(P) & Ors.	23° 12' 56.83''N 87° 49' 57.65''E , 23° 12' 55.06''N 87° 50' 1.97''E , 23° 12' 49.12''N 87° 49' 59.68''E , 23° 12' 50.86''N 87° 49' 54.72''E	Not Available	2-12-2018		
4	Sanjay Bhakat	1372/SB2021	Damodar	Bardhaman-I	Bangpur	32	1859(P) & Ors.	23° 12' 52.34''N 87° 50' 12.99"E, 23° 12' 51.49"N 87° 50' 17.65"E, 23° 12' 43.57"N 87° 50' 15.44"E, 23° 12' 44.88"N 87° 50' 11.17"E	Not Available	4-13-2018		
5	Mohan Choudhury	288/SB2021	Damodar	Bardhaman-I	Fakirpur	25	1293(P) & Ors.	23° 13' 11.96''N 87° 49' 35.71''E, 23° 13' 6.28''N 87° 49' 39.76''E, 23° 12' 58.35''N 87° 49' 35.83''E, 23° 13' 0.44''N 87° 49' 31.39''E	Not Available	10-1-2018		
6	Namita Enterprise	294/SB2021	Damodar	Bardhaman-I	ldilpur	24	1268(P) & Ors.	23° 13' 32.77"N 87° 48' 58.79"E, 23° 13' 30.72"N 87° 49' 4.05"E, 23° 13' 20.53"N 87° 49' 1.13"E, 23° 13' 22.49"N 87° 48' 56.50"E	Not Available	3-26-2018		
7	Namita Enterprise	323/SB2021	Damodar	Bardhaman-I	ldilpur	24	1420(P) & Ors.	23° 13' 30.56''N 87° 49' 4.53''E , 23° 13' 28.59''N 87° 49' 9.79''E , 23° 13' 18.34''N 87° 49' 6.14''E , 23° 13' 20.33''N 87° 49' 1.56''E	Not Available	3-26-2018		



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
8	Manir ul Mondal	1379/SB2021	Damodar	Bardhaman-I	Bangpur	32	1704(P) & Ors.	23° 12' 54.73''N 87° 50' 20.22''E, 23° 12' 57.19''N 87° 50' 21.84''E, 23° 12' 54.91''N 87° 50' 28.02''E, 23° 12' 50.85''N 87° 50' 25.47''E	Not Available	10-1-2018
9	Shib Narayan Show	1381/SB2021	Damodar	Bardhaman-I	Bangpur	32	1887(P0 & Ors.	23° 12' 53.78''N 87° 50' 8.42''E , 23° 12' 53.24''N 87° 50' 12.61''E , 23° 12' 46.69''N 87° 50' 11.23''E , 23° 12' 48.10''N 87° 50' 7.05''E	Not Available	10-6-2020
10	Subhas Kumar Poddar	291/SB2021	Damodar	Bardhaman-I	Fakirpur	25	1293(P) & Ors.	23° 13' 6.06"N 87° 49' 39.97"E , 23° 13' 1.80"N 87° 49' 45.74"E , 23° 12' 55.25"N 87° 49' 42.56"E , 23° 12' 58.26"N 87° 49' 36.13"E	1,29,000	2-7-2018
11	Raja Ghosh	1376/SB2021	Damodar	Bardhaman-I	Mirchoba	33	543(P) & Ors.	23° 12' 42.14"N 87° 51' 12.91"E, 23° 12' 37.19"N 87° 51' 10.54"E, 23° 12' 39.12"N 87° 51' 6.31"E, 23° 12' 44.06"N 87° 52' 8.68"E	55,200	4-13-2018
12	K90 Prop. Deal	1398/SB2021	Damodar	Bardhaman-II	Amirpur	85	735(P)	23° 11' 9.90''N 87° 55' 38.91''E , 23° 11' 7.37''N 87° 55' 42.45''E , 23° 10' 58.86''N 87° 55' 36.42''E , 23° 11' 0.26''N 87° 55' 33.64''E	85,500	1-24-2017
13	Himansu Santra	1577/SB2021	Damodar	Bardhaman-II	Kalinagar	160	181(P) & Ors.	23° 10' 21.51''N 87° 57' 11.71''E, 23° 10' 22.09''N 87° 57' 17.81''E, 23° 10' 17.11''N 87° 57' 17.13''E, 23° 10' 16.80''N 87° 57' 11.70''E	59,100	11-26-2018
14	Pawan Arora	1404/SB2021	Damodar	Bardhaman-II	D.Gopalp ur	165	1832(P)	23° 10' 7.11"N 87° 57' 59.34"E , 23° 10' 5.65"N 87° 58' 5.89"E , 23° 10' 0.37"N 87° 58' 4.05"E , 23° 10' 1.88"N 87° 57' 57.37"E	Not Available	1-31-2017
15	Success Nirayat	1400/SB2021	Damodar	Bardhaman-II	D.Gopalp ur	165	1832(P)	23° 10' 5.63"N 87° 58' 5.90"E , 23° 10' 4.17"N 87° 58' 12.32"E , 23° 9' 58.93"N 87° 51' 10.34"E , 23° 10' 0.36"N 87° 51' 4.07"E	Not Available	1-31-2017



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
16	G.S Industries	1565/SB2021	Damodar	Bardhaman-II	D.Gopalp ur	165	2019(P)	23° 10' 7.36''N 87° 57' 59.53''E , 23° 10' 8.88''N 87° 58' 5.97''E , 23° 10' 7.02''N 87° 58' 11.37''E , 23° 10' 4.83''N 87° 58' 10.86''E	Not Available	5-30-2018
17	Prasanta Kr. Hait	1561/SB2021	Damodar	Bardhaman-II	Becharha t	79	1632(P) & Ors.	23° 12' 18.15''N 87° 52' 9.03''E , 23° 12' 17.78''N 87° 52' 12.32''E , 23° 12' 5.86''N 87° 52' 11.27''E , 23° 12' 7.30''N 87° 52' 7.96''E	Not Available	7-6-2020
18	M/s Mondal Traders	1564/SB2021	Damodar	Bardhaman-II	Jafrabad	159	251(P)	23° 10' 25.69''N 87° 56' 58.30''E , 23° 10' 24.55''N 87° 57' 1.66''E , 23° 10' 18.33''N 87° 56' 59.99''E , 23° 10' 19.29''N 87° 56' 56.43''E	49,500	3-7-2018
19	Anil Adhikari	1539/SB2021	Damodar	Bardhaman-II	Chaitpur	84	1479(P) & Ors.	23° 11' 26.11''N 87° 55' 1.57"E , 23° 11' 23.55"N 87° 55' 8.99"E , 23° 11' 19.77"N 87° 55' 8.50"E , 23° 11' 21.50"N 87° 51' 1.90"E	63,000	3-7-2018
20	Buddhadeb Adhikari	1566/SB2021	Damodar	Bardhaman-II	Chaitpur		1480(P) & Ors.	23° 11' 30.10''N 87° 54' 46.65''E, 23° 11' 28.73''N 87° 54' 49.33''E, 23° 11' 27.22''N 87° 54' 52.54''E, 23° 11' 25.20''N 87° 54' 55.61''E, 23° 11' 24.11''N 87° 54' 58.26''E, 23° 11' 21.20''N 87° 54' 56.91''E, 23° 11' 22.15''N 87° 54' 54.99''E, 23° 11' 23.84''N 87° 54' 53.39''E	73,800	7-16-2018
21	Matiar Rahaman	1562/SB2021	Damodar	Bardhaman-II	Becharhat	79	1632(P) & Ors.	23° 12' 18.65''N 87° 52' 4.62''E , 23° 12' 8.80''N 87° 52' 3.91''E , 23° 12' 9.66''N 87° 52' 0.63''E , 23° 12' 19.04''N 87° 52' 1.18''E	68,700	7-6-2020
22	Sayed Neajuddin	1560/SB2021	Damodar	Bardhaman-II	Jafrabad	159	251(P) & Ors.	23° 10' 28.63''N 87° 56' 26.08"E, 23° 10' 31.35''N 87° 56' 22.32''E, 23° 10' 35.60''N 87° 56' 25.53''E, 23° 10' 33.21''N 87° 56' 28.86''E	75,600	1-10-2019



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
23	M/S Sayed Samad Hossain	1559/SB2021	Damodar	Bardhaman-II	Chaitpur	84	1520(P), 1521(P), 1518(P) & Ors.	23° 11' 35.28''N 87° 54' 39.56''E , 23° 11' 29.85''N 87° 54' 36.72''E , 23° 11' 32.39''N 87° 54' 28.66''E , 23° 11' 37.20''N 87° 54' 32.46''E	1,03,800	3-12-2021
24	M/S Sabina Yesmin Begum	1557/SB2021	Damodar	Bardhaman-II	Chaitpur	84	1481(P), 1531. 1532(P) & Ors.	23° 11' 33.50''N 87° 54' 46.32''E, 23° 11' 27.20''N 87° 54' 45.00''E, 23° 11' 29.62''N 87° 54' 37.41''E, 23° 11' 35.09''N 87° 54' 40.35''E	99,000	3-12-2021
25	Shyamal Singharoy	1549/SB2021	Damodar	Bardhaman-II	Hatsimul	81	1171, 1649, 1650, 1648 & Ors.	23° 12' 0.11''N 87° 53' 36.62''E , 23° 11' 51.34''N 87° 53' 35.04''E , 23° 11' 51.40''N 87° 53' 30.30''E , 23° 12' 1.75''N 87° 53' 31.83''E	1,04,400	3-12-2021
26	R.S.M.P Priject Pvt. Ltd.	338/SB2021	Damodar	Galsi-I	Simasimi	65	1450(P) & Ors.	23° 16' 33.21''N 87° 35' 5.95''E , 23° 16' 33.98''N 87° 35' 6.85''E , 23° 16' 29.33''N 87° 35' 12.06''E , 23° 16' 28.57''N 87° 35' 10.76''E	Not Available	12-26-2018
27	Ashok Kumar	1358/SB2021	Damodar	Galsi-II	Gohogram	70	6001(P)	23° 14' 39.74''N , 23° 14' 29.80''N , 23° 14' 32.30''N , 23° 14' 32.44''N 87° 37' 44.01''E, 87° 37' 49.08''E , 87° 37' 49.53''E, 87° 37' 44.25''E	1,01,100	1-10-2017
28	Satyanand Ray	359/SB2021	Damodar	Galsi-II	Gohogram	70	6001(P)	23° 14' 40.07''N 87° 37' 53.73''E , 23° 14' 30.87''N 87° 37' 54.69''E , 23° 14' 31.12''N 87° 37' 49.66''E , 23° 14' 41.65''N 87° 41' 3.70''E	97,200	1-10-2017
29	Yogendra Kr. Singh	368/SB2021	Damodar	Galsi-II	Gohogram	70	6002(P)	23° 14' 31.36''N 87° 37' 55.35''E , 23° 14' 40.14''N 87° 37' 54.49''E , 23° 14' 40.69''N 87° 37' 59.42''E , 23° 14' 31.78''N 87° 38' 0.57''E	1,00,800	1-10-2017
30	Maiher Developer	605/SB2021	Damodar	Galsi-II	D.Bhasap ur	79	439(P) & Ors.	23° 14' 30.78''N 87° 39' 13.29"E, 23° 14' 31.79"N 87° 39' 22.23"E, 23° 14' 27.31"N 87° 39' 22.57"E, 23° 14' 26.36"N 87° 39' 13.55"E	88,800	2-15-2017



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
31	Ramkrishn a Choudhury	606/SB2021	Damodar	Galsi-II	D.Bhasap ur	79	793(P)	23° 13' 49.31''N 87° 39' 29.48''E , 23° 13' 51.01''N 87° 39' 35.32''E , 23° 13' 44.78''N 87° 39' 37.33''E , 23° 13' 43.23''N 87° 39' 31.60''E	86,400	2-21-2017
32	Joydev Pal	607/SB2021	Damodar	Galsi-II	D.Bhasap ur	79	793(P)	23° 13' 54.45''N 87° 39' 47.17"E, 23° 13' 56.16"N 87° 39' 53.07"E, 23° 13' 49.55''N 87° 39' 54.89"E, 23° 13' 48.06"N 87° 39' 49.38"E	89,400	2-21-2017
33	Alok Sen	608/SB2021	Damodar	Galsi-II	Taherpur	88	1192(P)	23° 15' 13.90''N 87° 42' 2.23''E , 23° 15' 15.22''N 87° 41' 53.14''E , 23° 15' 10.55''N 87° 41' 53.04''E , 23° 15' 9.14''N 87° 42' 1.70''E	90,720	1-24-2017
34	Mukunda Mohan Khan	677/SB2021	Damodar	Galsi-II	Jujuti	123	951(P) & Ors.	23° 15' 8.10''N 87° 43' 22.20''E , 23° 15' 11.03''N 87° 43' 18.69''E , 23° 15' 10.90''N 87° 43' 27.61''E , 23° 15' 5.47''N 87° 43' 26.50''E	88,560	1-24-2017
35	Raja Ghosh	686/SB2021	Damodar	Galsi-II	Jujuti	123	1101(P)	23° 15' 1.85''N 87° 43' 33.07''E , 23° 15' 2.36''N 87° 43' 25.78''E , 23° 14' 59.61''N 87° 43' 25.61''E , 23° 14' 58.15''N 87° 43' 32.46''E	1,10,700	1-24-2017
36	Haque Mercantile	737/SB2021	Damodar	Galsi-II	Dumur	86	930(P)	23° 15' 1.21''N 87° 41' 17.41''E , 23° 15' 2.76''N 87° 41' 26.37''E , 23° 14' 56.49''N 87° 41' 25.17''E , 23° 14' 54.55''N 87° 41' 19.09''E	1,11,000	2-23-2018
37	Mukul Kundu	741/SB2021	Damodar	Galsi-II	Shikarpur	117	190(P) & Ors.	23° 14' 50.98''N 87° 40' 49.17"E, 23° 14' 50.64''N 87° 41' 4.50''E, 23° 14' 46.97''N 87° 41' 5.01"E, 23° 14' 41.65''N 87° 41' 3.70"E	1,15,200	4-16-2018
38	Variety Vyapaar Pvt. Ltd.	743/SB2021	Damodar	Galsi-II	Dadpur	89	2047(P)	23° 15' 14.80''N 87° 42' 15.78''E , 23° 15' 15.07''N 87° 42' 28.11''E , 23° 15' 11.64''N 87° 42' 28.20''E , 23° 15' 11.79''N 87° 42' 15.84''E	Not Available	1-8-2018



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
39	Ashim Kr. Panja	1442/SB2021	Damodar	Galsi-II	Gopalpur	87	321(P)	23° 15' 0.53"N 87° 41' 28.55"E , 23° 15' 0.72"N 87° 41' 31.98"E , 23° 14' 52.92"N 87° 41' 35.90"E , 23° 14' 48.88"N 87° 41' 28.60"E	Not Available	10-1-2018
40	Jogendra Barman	627/SB2021	Damodar	Galsi-II	Shikarpur	117	1901(P) & Ors.	23° 14' 35.02''N 87° 40' 48.16''E , 23° 14' 39.28''N 87° 40' 51.89''E , 23° 14' 31.28''N 87° 40' 59.54''E , 23° 14' 29.29''N 87° 40' 54.41''E	1,18,200	8-10-2018
41	Anita Barman	628/SB2021	Damodar	Galsi-II	Shikarpur	117	1901(P) & Ors.	23° 14' 28.53''N 87° 40' 41.85''E , 23° 14' 34.57''N 87° 40' 47.79''E , 23° 14' 29.25''N 87° 40' 53.62''E , 23° 14' 26.53''N 87° 40' 46.67''E	1,03,800	8-10-2018
42	Innaya Enterprise	751/SB2021	Damodar	Galsi-II	Dumur	86	1001(P)	23° 14' 51.45''N 87° 41' 12.82''E , 23° 14' 52.70''N 87° 41' 16.50''E , 23° 14' 39.58''N 87° 41' 17.66''E , 23° 14' 37.39''N 87° 41' 14.07''E	1,13,700	10-1-2018
43	Jogendra Barman	754/SB2021	Damodar	Galsi-II	Shikarpur	117	1867(P)	23° 14' 27.08''N 87° 40' 40.32''E , 23° 14' 25.73''N 87° 40' 46.27''E , 23° 14' 18.74''N 87° 40' 39.45''E , 23° 14' 19.93''N 87° 40' 33.12''E	1,17,600	10-1-2018
44	Maa Sarbamang ala Quality Sand	760/SB2021	Damodar	Galsi-II	Shikarpur	117	1867(P)	23° 14' 19.52''N 87° 40' 32.67''E , 23° 14' 18.30''N 87° 40' 39.02''E , 23° 14' 10.67''N 87° 40' 31.50''E , 23° 14' 11.97''N 87° 40' 25.66''E	1,25,700	10-1-2018
45	Mahabat Traders	1066/SB2021	Damodar	Jamalpur	Sanchara	19	1259(P)	23° 8' 37.99"N 88° 0' 31.77"E, 23° 8' 37.88"N 88° 0' 34.70"E, 23° 8' 30.81"N 88° 0' 35.45"E, 23° 8' 31.27"N 88° 0' 31.68"E	Not Available	3-29-2017
46	Santilata Roy	1158/SB2021	Damodar	Jamalpur	Haibatpur	4	819(P)	23° 9' 10.45"N 88° 0' 23.22"E , 23° 9' 9.73"N 88° 0' 24.02"E , 23° 9' 4.51"N 88° 0' 27.70"E , 23° 9' 3.26"N 88° 0' 23.94"E	Not Available	1-2-2018



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
47	Manas Kr. Dhara	1148/SB2021	Damodar	Jamalpur	Selimabad	30	953(P)	23° 4' 49.58"N 87° 59' 31.60"E , 23° 4' 48.82"N 87° 59' 25.68"E , 23° 4' 52.75"N 87° 59' 25.18"E , 23° 4' 53.02"N 87° 59' 31.62"E	Not Available	12-7-2018
48	Kamal Kr. Ghosh	1152/SB2021	Damodar	Jamalpur	Dadpur	9	443(P)	23° 6' 50.83''N 87° 59' 31.84''E , 23° 6' 48.98''N 87° 59' 33.16''E , 23° 6' 47.18''N 87° 59' 30.72''E , 23° 6' 48.00''N 87° 59' 28.40''E	Not Available	1-8-2019
49	Basudev Majhi	1166/SB2021	Damodar	Jamalpur	Kansra	44	1345(P)	23° 2' 56.43''N 87° 58' 51.49''E , 23° 2' 57.02''N 87° 58' 47.56''E , 23° 3' 3.07''N 87° 58' 48.19''E , 23° 3' 3.05''N 87° 58' 50.62''E	Not Available	1-14-2019
50	Maa Durga Coal	1162/SB2021	Damodar	Jamalpur	Selimabad	30	952(P) & Ors.	23° 5' 3.80''N 87° 59' 25.84''E , 23° 5' 4.22''N 87° 59' 32.92''E , 23° 5' 0.65''N 87° 59' 32.15''E , 23° 5' 0.18''N 87° 59' 25.25''E	51,900	11-12-2018
51	Sk. Islam Hossen	1155/SB2021	Damodar	Jamalpur	Selimabad	30	953(P)	23° 4' 59.75''N 87° 59' 25.03''E , 23° 5' 0.24''N 87° 59' 32.06''E , 23° 4' 57.17''N 87° 59' 31.81''E , 23° 4' 56.70''N 87° 59' 25.00''E	42,000	11-12-2018
52	Sayed Neajuddin	1144/SB/2021	Damodar	Jamalpur	Dadpur	9	442(P)	23° 7' 14.93"N 87° 59' 17.59"E , 23° 7' 12.71"N 87° 59' 18.20"E , 23° 7' 11.63"N 87° 59' 19.73"E , 23° 7' 10.56"N 87° 59' 18.76"E	12,300	1-14-2019
53	Soumitra Adhikary	1150/SB2021	Damodar	Jamalpur	Kansra	44	1345(P)	23° 3' 7.06''N 87° 58' 49.58''E , 23° 3' 7.05''N 87° 58' 52.58''E , 23° 3' 0.13''N 87° 58' 52.71''E , 23° 3' 0.09''N 87° 58' 50.29''E	40,500	8-13-2020
54	Basiruddin Seikh	1136/SB2021	Bhagirathi	Kalna-I	Krishnadeb pur	91	2251(P) & Ors.	23° 14' 40.70''N 88° 21' 3.91"E , 23° 14' 36.10''N 88° 21' 8.37"E , 23° 14' 34.71''N 88° 21' 4.78"E , 23° 14' 38.65''N 88° 21' 1.07"E	Not Available	9-29-2018



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
55	Manik Ch. Mondal	1048/SB/2021	Damodar	Khandaghosh	Kumirkhola	9	1404(P) & Ors.	23° 14' 50.14''N 87° 41' 34.07"E, 23° 14' 51.34"N 87° 41' 36.98"E, 23° 14' 39.66"N 87° 41' 37.74"E, 23° 14' 38.88"N 87° 41' 34.38"E	78,000	6-23-2018
56	M/s Alam Enterprise	1055/SB/2021	Damodar	Khandaghosh	Kumirkhola	9	1471(P) & ors.	23° 14' 42.00''N 87° 41' 47.29"E, 23° 14' 41.18"N 87° 41' 43.95"E, 23° 14' 53.67"N 87° 41' 43.17"E, 23° 14' 55.33"N 87° 41' 46.38"E	91,800	8-23-2018
57	New Kalimata Sand	999/SB/2021	Damodar	Khandaghosh	Gaitanpur	65	1576 & Ors.	23° 13' 55.39''N 87° 47' 59.97''E , 23° 13' 52.55''N 87° 48' 5.58''E , 23° 13' 46.03''N 87° 48' 1.57''E , 23° 13' 48.91''N 87° 47' 56.00''E	94,500	11-24-2017
58	Kartick Ch. Ghosh	1029/SB/2021	Damodar	Khandaghosh	Tildanga	66	299(P) & Ors.	23° 13' 38.77''N 87° 48' 36.57"E, 23° 13' 35.71''N 87° 48' 38.32''E, 23° 13' 34.33''N 87° 48' 35.20"E, 23° 13' 35.63''N 87° 48' 34.31"E, 23° 13' 35.97''N 87° 48' 32.77''E	Not Available	12-14-2017
59	Corum Trade & Services	1032/SB/2021	Damodar	Khandaghosh	Gaitanpur	65	1552(P) & Ors.	23° 13' 58.26''N 87° 47' 54.18''E , 23° 13' 55.44''N 87° 49' 59.65''E , 23° 13' 48.97''N 87° 47' 55.73''E , 23° 13' 51.61''N 87° 47' 50.14''E	Not Available	11-22-2017
60	Ashim Kr. Panja	1052/SB/2021	Damodar	Khandaghosh	Kumirkhola	9	1462(P) & Ors.	23° 14' 40.53''N 87° 41' 40.44"E, 23° 14' 40.46"N 87° 41' 37.34"E, 23° 14' 52.30"N 87° 41' 37.40"E, 23° 14' 53.18"N 87° 41' 40.67"E	84,000	3-23-2018



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
61	Packhorse Traders Pvt. Ltd	1068/SB/2021	Damodar	Khandaghosh	Kumirkhola	9	699(P), 670, 742, 750 & Ors.	23° 14' 41.80''N 87° 42' 2.00''E, 23° 14' 41.30''N 87° 41' 59.70''E, 23° 14' 40.60''N 87° 41' 55.90''E, 23° 14' 40.40''N 87° 41' 51.30''E, 23° 14' 39.60''N 87° 41' 49.90''E, 23° 14' 39.90''N 87° 41' 48.20''E, 23° 14' 39.61''N 87° 41' 47.42''E, 23° 14' 40.30''N 87° 41' 45.08''E, 23° 14' 42.80''N 87° 41' 45.08''E, 23° 14' 44.50''N 87° 41' 47.80''E, 23° 14' 45.10''N 87° 41' 52.40''E, 23° 14' 45.10''N 87° 41' 53.50''E, 23° 14' 44.70''N 87° 41' 55.20''E	1,25,100	3-12-2021
62	Bikash Ghosh	1058/SB/2021	Damodar	Khandaghosh	Kumirkhola	9	1665(P), 1608(P) & Ors.	23° 14' 55.18''N 87° 42' 29.34"E, 23° 14' 48.91''N 87° 42' 24.38"E, 23° 14' 48.09''N 87° 42' 22.76"E, 23° 14' 48.34''N 87° 42' 19.99"E	90,900	3-12-2021
63	M/s Rajen Roy	1062/SB/2021	Damodar	Khandaghosh	Kumirkhola	9	1665(P), 1608(P) & Ors.	23° 15' 3.45''N 87° 42' 33.98''E , 23° 14' 59.25''N 87° 42' 32.60''E , 23° 14' 56.61''N 87° 42' 30.48''E , 23° 14' 57.52''N 87° 42' 23.15''E	1,22,700	3-12-2021
64	Goutam Pal	1072/SB/2021	Damodar	Khandaghosh	Kumirkhola	9	796(P), 798(P), 830 & Ors.	23° 14' 42.10''N 87° 42' 29.80''E , 23° 14' 36.00''N 87° 42' 26.40''E , 23° 14' 41.60''N 87° 42' 19.00''E , 23° 14' 46.20''N 87° 42' 23.20''E	1,26,900	3-12-2021
65	Samir Mondal	1208/SB2021	Damodar	Memari-I	Chanchai	46	565(P), 566(P)	23° 9' 21.26''N 88° 0' 18.79"E , 23° 9' 17.34''N 88° 0' 23.04"E , 23° 9' 14.72"N 88° 0' 20.69"E , 23° 9' 19.26"N 88° 0' 16.12"E	42,300	1-10-2017
66	Maa Durga Coal	1244/SB2021	Damodar	Memari-I	Palla	45	4031(P) & Ors.	23° 9' 44.82''N 87° 59' 48.88''E , 23° 9' 42.84''N 87° 59' 54.53''E , 23° 9' 39.07''N 87° 59' 52.83''E , 23° 9' 41.37''N 87° 59' 47.41''E	49,200	7-16-2018



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
67	Chandan Garai	1238/SB2021	Damodar	Memari-I	Palla	45	4030(P) & Ors.	23° 9' 47.20''N 87° 59' 43.25''E , 23° 9' 45.13''N 87° 59' 48.46''E , 23° 9' 41.57''N 87° 59' 46.90''E , 23° 9' 45.23''N 87° 59' 42.46''E	Not Available	7-16-2018
68	Santilata Roy	1247/SB2021	Damodar	Memari-I	Palla	45	4000(P) & Ors.	23° 9' 40.63"N 88° 0' 0.24"E , 23° 9' 38.34"N 88° 0' 5.25"E , 23° 9' 34.42"N 88° 0' 3.18"E , 23° 9' 36.71"N 87° 59' 58.05"E	Not Available	10-1-2018
69	Abhisek Arora	1251/SB2021	Damodar	Memari-I	Palla	45	4099(P) & Ors.	23° 9' 42.68"N 87° 59' 54.95"E , 23° 9' 40.84"N 87° 59' 59.82"E , 23° 9' 36.86"N 87° 59' 57.60"E , 23° 9' 38.83"N 87° 59' 53.19"E	Not Available	1-14-2019
70	Raikamal Chakrabort Y	1532/SB2021	Ajay	Mongalkote	Keotsa	88	662(P) & Ors.	23° 37' 47.00''N 87° 57' 26.62''E , 23° 37' 50.51''N 87° 57' 33.55''E , 23° 37' 45.97''N 87° 57' 36.14''E , 23° 37' 43.35''N 87° 57' 31.90''E	89,400	5-22-2018
71	Muns hi Md. Hasanuzza man	1528/SB2021	Ajay	Mongalkote	Keotsa	88	444(P) & Ors.	23° 37' 50.45''N 87° 57' 34.03''E , 23° 37' 50.29''N 87° 57' 44.22''E , 23° 37' 47.59''N 87° 57' 44.65''E , 23° 37' 46.10''N 87° 57' 36.57''E	72,300	4-9-2018
72	Jiaur Rahaman	1531/SB2021	Ajay	Mongalkote	Maliara	89	1091(P)	23° 37' 45.82''N 87° 58' 3.18''E , 23° 37' 44.88''N 87° 58' 9.37''E , 23° 37' 43.73''N 87° 58' 13.68''E , 23° 37' 42.28''N 87° 58' 13.41''E , 23° 37' 42.69''N 87° 58' 6.92''E	43,500	4-9-2018
73	Munshi Hardwear	1533/SB2021	Ajay	Mongalkote	Maliara	89	1091(P)	23° 37' 43.62''N 87° 58' 2.69''E , 23° 37' 45.74''N 87° 57' 53.19''E , 23° 37' 47.95''N 87° 57' 54.26''E , 23° 37' 45.85''N 87° 58' 3.13''E	43,200	4-11-2018
74	Ashok Kr. Saha	1536/SB2021	Ajay	Mongalkote	Sagira	56	841(P) & Ors.	23° 33' 30.03''N 87° 53' 21.68''E , 23° 33' 28.46''N 87° 53' 25.21''E , 23° 33' 25.71''N 87° 53' 29.38''E , 23° 33' 24.89''N 87° 53' 27.69''E , 23° 33' 26.93''N 87° 53' 24.39''E	23,400	10-1-2018



Sl No.	Name of H1 bidder	Sand ghat ID on centralized	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per	LOI DATE
		portal							year)	
75	Ashok Kr. Saha	1558/SB2021	Ajay	Mongalkote	Kogram	58	284(P0 & Ors.	23° 32' 49.90''N 87° 53' 35.90''E, 23° 32' 50.35''N 87° 53' 38.11''E, 23° 32' 46.11''N 87° 53' 40.77''E, 23° 32' 43.31''N 87° 53' 41.80''E, 23° 32' 39.52''N 87° 53' 42.49''E, 23° 32' 35.82''N 87° 53' 45.75''E, 23° 32' 30.77''N 87° 53' 48.15''E, 23° 32' 30.46''N 87° 53' 47.69''E	70,200	10-1-2018
76	Manirul Mondal	1527/SB2021	Ajay	Mongalkote	Madhpur	86	1416(P)	23° 36' 40.75''N 87° 57' 3.40''E , 23° 36' 40.69''N 87° 57' 3.72''E , 23° 36' 35.99''N 87° 57' 3.63''E , 23° 36' 32.72''N 87° 57' 2.63''E , 23° 36' 33.03''N 87° 57' 0.32''E	20,400	8-25-2018
77	Binoy Dhara	1529/SB2021	Ajay	Mongalkote	Kherua	97	827(P) & Ors.	23° 37' 55.37''N 87° 59' 40.32''E, 23° 37' 58.52''N 87° 59' 40.49''E, 23° 37' 59.00''N 87° 59' 43.07''E, 23° 38' 0.05''N 87° 59' 45.94''E, 23° 38' 4.10''N 87° 59' 53.52''E, 23° 38' 2.22''N 87° 59' 54.39''E, 23° 37' 58.00''N 87° 59' 47.19''E	Not Available	1-10-2019
78	Md. Hasibul Hossen	1469/SB2021	Ajay	Mongalkote	Keotsa	88	671,672,673 ,67 4 & Ors.	23° 37' 44.98''N 87° 57' 26.69''E, 23° 37' 43.74''N 87° 57' 26.72''E, 23° 37' 42.48''N 87° 57' 26.15''E, 23° 37' 41.65''N 87° 57' 25.08''E, 23° 37' 41.05''N 87° 57' 22.62''E, 23° 37' 38.97''N 87° 57' 19.86''E, 23° 37' 40.95''N 87° 57' 18.31''E, 23° 37' 42.78''N 87° 57' 19.49''E, 23° 37' 44.74''N 87° 57' 21.25''E	68,700	4-20-2021
79	Srijonee Engineers Co. Op. Society	880/SB/2021	Damodar	Raina-II	Narasinhap ur	206	380(P)	22° 58' 52.28''N 87° 56' 44.06''E , 22° 58' 49.36''N 87° 56' 45.95''E , 22° 58' 47.32''N 87° 56' 45.32''E , 22° 58' 49.93''N 87° 56' 35.47''E	46,200	9-28-2018



Sl No.	Name of H1 bidder	Sand ghat ID on centralized portal	River Name	Block Name	Mouza	JL no.	Plot	Latitude & Longitude (minimum 4 geo coordinates)	MINEABLE RESERVE (Cubic mt. per year)	LOI DATE
80	R.S Constructio n	901/SB/2021	Damodar	Raina-II	Kotsimul	208	1349(P)	22° 56' 58.95''N 87° 56' 19.23''E , 22° 56' 58.41''N 87° 56' 28.02''E , 22° 56' 55.45''N 87° 56' 28.08''E , 22° 56' 56.17''N 87° 56' 18.37''E	55,200	11-12-2018
81	Brijnandan Gupata	1386/SB/2021	Damodar	Raina-II	Kotsimul	208	1349(P)	22° 56' 48.23''N 87° 56' 15.67''E , 22° 56' 47.18''N 87° 56' 22.71''E , 22° 56' 43.96''N 87° 56' 21.64''E , 22° 56' 45.26''N 87° 56' 14.12''E	Not Available	9-28-2018
82	Dibyendu Dey	887/SB/2021	Damodar	Raina-II	Kotsimul	208	834(P) & Ors.	22° 57' 18.44''N 87° 56' 21.99"E, 22° 57' 18.06"N 87° 56' 24.53"E, 22° 57' 13.97"N 87° 56' 26.28"E, 22° 57' 7.19"N 87° 56' 25.44"E, 22° 57' 7.30"N 87° 56' 23.29"E	Not Available	9-28-2018
83	Maa Tara Builders	893/SB/2021	Damodar	Raina-II	Kotsimul	208	1349(P)	22° 57' 2.41"N 87° 56' 20.47"E , 22° 57' 1.95"N 87° 56' 27.85"E , 22° 56' 59.33"N 87° 56' 27.95"E , 22° 56' 58.79"N 87° 56' 27.96"E	Not Available	9-28-2018



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.

SL. NO	BLOCK ID	AREA (Ha)	DSR POTENTIAL ZONE CODE	BLOCK	RIVER
1	MIN_EBUR_24	9.15	PBBD_AS2_AJ_01W	AUSGRAM 2	AJAY
2	MIN_EBUR_25	6.65	PBBD_BD2_DA_13(XIIIB)	BARDHAMAN 2	DAMODAR
3	MIN_EBUR_28	7.7	PBBD_GL2_DA_03_04	GALSI 2	DAMODAR
4	MIN_EBUR_29	3.43	PBBD_GL2_DA_03_04	GALSI 2	DAMODAR
5	MIN_EBUR_13	8.58	PBBD_KG2_AJ_19	KETUGRAM 2	AJAY
6	MIN_EBUR_47	21.90	PBBD_BD2_DA_15(XVA)	BARDHAMAN 2	DAMODAR RIVER

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






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Figure 8.1: Auction block map plotted on potential sand blocks of Purba Bardhaman district

#### 8.3 Detail of production of sand and other minerals during last three years

Last 3 years production of minor mineral of the District is furnished in Table 8.3.

Sl. No.	Year	Name of mineral	Total Production (inCft.)	Total Production in cum		
1	2016-2017	Sand	64972074	1839787		
2	2017-2018	Sand 126800961		3590569		
3	2018-2019	Sand	112087089	3173923		
4	2019-2020	Sand	112287191	3179589		
5	2020-2021	Sand	104672467	2963966		
6	2021-2022 (As on Sept, 2021)	Sand	26884723	761283.4		
			547704505	15509118		

#### Table 8.3: Details of production of sand in the district

Conversion factor: 1cum=35.315 cft

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# 9 Details of revenue generated from mineral sector during last three years

Revenue generated for last 3 years in Purba Bardhaman District is furnished in Table

9.1.

Financial Year	Royalty (Rupees)
2017-18	210390039
2018-19	185317113
2019-20	184479730
2020-21	173506070
2021-22 (As on Sept'21)	44075894
Total	797768846

 Table 9.1: District revenue generation from mineral sector (In cr.)



#### **10 Transport**

Kolkata-Agra National Highway 19 (old numbering NH 2), covering a large part of the old Grand Trunk Road passes through this district. The other highways passing through the district are: National Highway 114, State Highway 6, State Highway 7, State Highway 13 (covering a large part of the old Grand Trunk Road), State Highway 14 and State Highway 15 (Figure 10.1).

The Howrah-Bardhaman main line and Howrah-Bardhaman chord, both part of Kolkata Suburban Railway System, enter this district and converge at Saktigarh Railway Station. The Bardhaman-Asansol Section, which is part of Howrah-Delhi main line, Howrah-Gaya-Delhi line and Howrah-Allahabad-Mumbai line, and the Bardhaman-Kiul Sahibganj Loop leave at the other end of the district. The Bardhaman-Katwa line, after conversion from narrow gauge to electrified broad gauge, was opened to the public on 12 January 2018.

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 10.1: Transportation map of Purba Bardhaman District (Source: National Informatics Centre)







Figure 10.2: Map showing approach road to potential sand bars (Source: National Informatics Centre)



# PART B: INSITU MINOR MINERAL DEPOSITS



#### 11 In-situ Minerals:

#### **11.1 Mineral Reserve**

Mineral resources of the district are still not well established, the district does not have reserve of any major mineral deposits.

#### **11.2 Mineral Potential**

Sand is the important riverbed mineral found to be potential for mining. A considerable quantity of quality sands is found to occur in the riverbed of the district.

The district also has potential deposits of Laterite located in the western part of the district. The undulating laterite topography of Paschim Bardhaman district extends up to the Ausgram of Purba Bardhman district.

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

								Location of potential mineralized zones				Area withi	
Na me of min eral	Nam e of assoc iated mine rals, if any	Host rock of mineral ization	Area of mineral ization	Depth of mineral ization	Whe ther virgi n or parti ally exca vate d	Name of land (whether free for mining/forest /agricultural	Minera l reserve (appro ximate) mentio ning grade	Admini strative Block	Mouza	Pl ot N o. s	Co- ordinat es	n prohi bited zone as per rule 3(7) of WB MMC Rules , 2016	Infrast ructure availab le near the minera lized zone
1	2	3	4	5	6	7	8	9			10	11	
Mor rum	Nil	Laterite	72.79ha	15m	Parti ally exca vate d	Agricultural land	Partial y explore d	Ausgram           23° 26' 48.776"         87° 34' 0.309" E           N         23° 26' 49.707"           23° 26' 49.707"         87° 34' 39.433" E           23° 26' 29.518"         87° 34' 41.428" E           N         87° 34' 41.428" E           23° 26' 28.374"         87° 33' 58.351" E		Nil	Road networ k availab le		

#### Table 11.1: In-situ Minerals Occurrences

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Figure 11.1: In-situ mineral occurrences shown on geological map of the district (Source: GSI, 2001)
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# 11.3 Mineral development prospect of the district with respect to Minor Mineral

The district is not very rich in mineral resources and there are no mines in the district. However, collections of sand from the river-bed are the minor mineral sources. In this district some of big rivers are flowing like Ajay, Damodar, Hoogly and Dwarakeswar, so in this region it has seen that the different geomorphic features like Alluvium Plain, Alluvial Fan etc, which are create by river deposition activity. So, in this region there is huge deposition of sand, clay has found, so the sand mining or the sand industry should the very useful for this district.

The district generated revenueu from other in-situ minor minerals and is given in Table 11.2.

Sl.N o.	Auction ID	Bidder Name	Miner al	Lat-Long	Name of Block	Mouza	JL No.	Plot No.	Area (in Hectars)
1	2018_WB_ 974	M/s National Traders	Morru m	A. 23°26'35.54"N 87°34'24.06"E B. 23°26'37.46"N 87°34'24.58"E C. 23°26'39.45"N 87°34'25.29"E D. 23°26'40.21"N 87°34'25.32"E E. 23°26'42.49"N 87°34'26.56"E F. 23°26'43.19"N 87°34'27.41"E G. 23°26'43.97"N 87°34'27.56"E H. 23°26'43.97"N 87°34'29.89"E I. 23°26'42.91"N 87°34'29.89"E J. 23°26'38.85"N 87°34'26.92"E	Ausgram-II	Amaragarh	57	202	1.68
				K. 23°26'38.02"N 87°34'27.21"E L. 23°26'35.25"N 87°34'24.57"E					

#### Table 11.2: List of existing mining leases of the district (other than sand)

#### 11.4 Exploration requirement of the district

In this district the sand industry might be very much useful. Therefore, there is a need more scientific sand mining procedure. Alongwith sand, lateritic deposits also noted in the western part. So the scope Exploration in this district is very high. It is highly recommended to conduct detailed exploration (G2 level) to establish mineral resources of the district.



## 12 Remedial measure to mitigate the impact of mining

12.1. Environmental Sensitivity

Purba Bardhaman district 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.

#### 12.3.5. Bio-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.

#### 12.3.7. Waste 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 m 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.

f) 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 be carried 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 risks 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

#### 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.



#### 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.

#### Measures for mitigation to quick sand condition:

- Quick sand zone and deep water zone will be clearly demarcated and all the mine 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 MinesRules 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 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 has been incorporated in the report.

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 land of Purba Bardhaman district is a quaternary alluvial deposition and alluvial plain of the district divided into four prominent topographical regions. In the north, the Kanksa Ketugram Plain, Bardhaman Plain occupies the central area of the district, with the Damodar on the south and the south-east. On the southern part is the Khandaghosh Plain. The Damodar, Ajay, Hoogly and Dwarakeswar Rivers are the important rivers of Purba Bardhaman district.

In Purba Bardhaman district, as per the report published by Directorate of Mines and Minerals, Government of West Bengal, there is no major minerals deposits noted. The district is having riverbed deposits which are generating revenue for the district mainly. Presence of lateritic deposits at the western part of the district also marked as a potential zone for mining.

The district is generating considerable revenue from mining of minor minerals such as riverbed sand deposits. Revenue generated in the district of Purba Bardhaman from Minor minerals during the period of April 2017 to September 2021 is Rs. 79.77 crores.

The district has an upside potential for development of riverbed sand. The occurrence has been reported by Directorate of Mines and Minerals, Government of West Bengal and others in previous instances. It requires further systematic and scientific approach to quantify the resource along with their grade assessment. The occurrences are mostly observed in the river Damodar and Ajay River. This report also recommends undertaking detail exploration (G2 level) program to assess the mineral occurrences in the major rivers of the district and should have a proper development and production plan for the specified minerals.



#### 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 97.4 to 98.5% in the district and for theoretical replenishment study based on mining lease shows variation from 70% to 77.50% with an average of 74% of replenishment rate in the district.
- V. The total potential riverbed deposit for the district comes to about 58.38 Mcum.

#### 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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# 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 PURBA BARDHAMAN DISTRICT





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





Plate 2A2: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)





Plate 2A3: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)





Plate 2A4: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)





Plate 2A5: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)





Plate 2A6: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)





Plate 2A7: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)





Plate 2A8: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)





Plate 2A9: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)



## PLATE 2B

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





Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

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Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B2: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B3: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





| Plate 2B4: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B5: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B6: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B7: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B7: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B7: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)





Plate 2B8: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purba Bardhaman District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)



# PLATE 3

## WATERSHED MAP OF THE DISTRICT



Plate 3A: Watershed Map of Purba 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 Damodar Riverbed deposit (Date: 16-05-22, Lat: 23° 14' 12" N and Long: 87° 47' 59" E) 4A: Picture of Dwarakeswar Riverbed deposit (Date: 16-05-22, Lat: 22° 57' 33" N and Long: 87° 45' 52" 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 Dwarakeswar River, Purba 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 <sup>3</sup> / <sub>4</sub> th part of the river, width needs to be identified on a map. Out of the <sup>3</sup> / <sub>4</sub> th part area, where there is a deposition/aggradation of the material needs to be identified. The remaining <sup>1</sup> / <sub>4</sub> th 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.
L	Annexure-1	Page A1- 2



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-1

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Annexure 2

Estimation of Sand Resources based on sediment load comparison between Pre and Post Monsoon period of Purba Bardhaman District



ABBREVIATION FORM							
PERIOD	PRE PRE MONSOON						
	РО	POST MONSOON					
DISTRICT	PBBD	PURBA BARDHAMAN					
	MK	MANGOLKOTE					
	KG1	KETUGRAM 1					
	KG2	KETUGRAM 2					
	KT1	KATWA 1					
	KT2	KATWA 2					
	PS2	PURBASTHALI 2					
	GL1	GALSI 1					
BLOCK	GL2	GALSI 2					
	KH	KHANDAGHOSH					
	BD1	BARDHAMAN 1					
	BD2	BARDHAMAN 2					
	ME1	MEMARI 1					
	RN2	RAINA 2					
		BARDHAMAN					
	BDMC	MUNICIPALITY					
	AJ	AJAY					
RIVER	DA	DAMODAR					
	DW	DWARAKESWAR					
	HO	HOOGLY					



Pre monsoon						Post monsoon					
SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thick ness in m.	Sand Volume in M. Cum	SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thick ness in m.	Sand Volume in M. Cum
	Estimation	of Sand 1	Resources i	in Pre m	onsoon per	riod & Po	st monsoon period in sand bar 1	regions o	f Ajay River		
						1	PO_PBBD_MK_AJ_01A	44	21926.50363	3	0.066
						2	PO_PBBD_MK_AJ_01B	44	52981.13407	3	0.159
						3	PO_PBBD_MK_AJ_01C	46	4369.574524	3	0.013
						4	PO_PBBD_MK_AJ_01D	47	24795.57582	3	0.074
						5	PO_PBBD_MK_AJ_01E	45	237682.896	3	0.713
						6	PO_PBBD_MK_AJ_01F	46	222283.8026	3	0.667
						7	PO_PBBD_MK_AJ_01G	47	63923.78816	3	0.192
						8	PO_PBBD_MK_AJ_01H	49	7342.23912	3	0.022
						9	PO_PBBD_MK_AJ_01I	50	50509.47039	3	0.152
						10	PO_PBBD_MK_AJ_01J	52	78306.24806	3	0.235
						11	PO_PBBD_MK_AJ_01K	55	27362.64997	9.47039 3 0.152   6.24806 3 0.235   2.64997 3 0.082   .341595 3 0.018	
	PR_PBBD_MK_AJ_01	55	157182.7	2.7	0.42	12	PO_PBBD_MK_AJ_01L	55	5883.341595	3	0.018
1						0.42	13	PO_PBBD_MK_AJ_01M	54	10668.39427	3
							14	PO_PBBD_MK_AJ_01N	56	39596.54537	3
						15	PO_PBBD_MK_AJ_01O	55	20182.57537	3	0.061
						16	PO_PBBD_AS2_AJ_01P	56	12459.95753	3	0.037
						17	PO_PBBD_AS2_AJ_01Q	55	2509.411998	3	0.008
						18	PO_PBBD_AS2_AJ_01R	56	9755.83538	3	0.029
						19	PO_PBBD_AS2_AJ_01S	57	0.0121000000000000000000000000000000000		
						20	PO_PBBD_AS2_AJ_01T	59	219306.2449	3	0.658
						21	PO_PBBD_AS2_AJ_01U	60	322840.1618	3	0.969
						22	PO_PBBD_AS2_AJ_01V	58	61322.48597	3	0.184
						23	PO_PBBD_AS2_AJ_01W	58	194542.5063	3	0.584
						24	PO_PBBD_AS2_AJ_01X	59	94564.41743	3	0.284
						25	PO_PBBD_AS2_AJ_01Y	61	63724.51272	3	0.191

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Pre monsoon							Post monsoon				
SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thick ness in m.	Sand Volume in M. Cum	SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thick ness in m.	Sand Volume in M. Cum
						26	PO_PBBD_AS2_AJ_01Z	65	182410.2555	3	0.547
						27	PO_PBBD_AS2_AJ_01Z_I	65	31958.61611	3	0.096
						28	PO_PBBD_MK_AJ_01	45	28812.22715	3	0.086
2	PR_PBBD_MK_AJ_02	45	134143.4	2.7	0.36		PO_PBBD_MK_AJ_02	0	0		0
3	PR_PBBD_MK_AJ_03	43.5	294584.7	2.7	0.8	29	PO_PBBD_MK_AJ_03	44	385250.717	3	1.156
4	PR_PBBD_KG1_AJ_04	44.5	33616.18	2.7	0.09	30	PO_PBBD_KG1_AJ_04	45	171887.6998	3	0.516
5	PR_PBBD_KG1_AJ_05	42.5	135760.7	2.7	0.37	01	PO PRPD KC1 AL of 06	40	071608 8567	0	0.81
6	PR_PBBD_KG1_AJ_06	42	56440.38	2.7	0.15	31	10_1ppp_k01_w_02_00	43	2/1038.850/	3	0.81
7	PR_PBBD_MK_AJ_07	41.5	18826.42	2.7	0.05	00	DO DEED MV AL OF OS	10	F 4059 0 4100	0	0.16
8	PR_PBBD_MK_AJ_08	41	40408.95	2.7	0.11	32	PO_PDDD_MIK_AJ_0/_08	42	542/0.24139	3	0.10
9	PR_PBBD_KG1_AJ_09	41.5	193728.3	2.7	0.52	00	DO DEPD VC1 AL 00 10	10	0996450999	0	1.17
10	PR_PBBD_KG1_AJ_10	41	42951.56	2.7	0.12	33	r0_rbbb_kG1_A0_09_10	42	30004/.2000	3	1.17
11	PR_PBBD_KG1_AJ_11	40.5	214319.5	2.7	0.58	34	PO_PBBD_KG1_AJ_11	41	238416.8502	3	0.72
12	PR_PBBD_MK_AJ_12	40.5	42353.54	2.7	0.11	35	PO_PBBD_MK_AJ_12	41	50458.31538	3	0.15
13	PR_PBBD_KG1_AJ_13	40	24154.02	2.7	0.07		PO_PBBD_KG1_AJ_13	-	0	3	0.00
		10			0.01	36	PO_PBBD_KG2_AJ_14	40	71158.20536	3	0.21
14	rK_rbbD_KG2_AJ_14	40	7/150.04	2.7	0.21	37	PO_PBBD_KG2_AJ_14A	40	90246.43057	3	0.27
15	PR_PBBD_KG2_AJ_15	38.5	174895.2	2.7	0.47	38	PO_PBBD_KG2_AJ_15	39	206508.3115	3	0.62
16	PR_PBBD_KG2_AJ_16	38.5	71735.68	2.7	0.19	39	PO_PBBD_KG2_AJ_16	39	188955.8838	3	0.57
17	PR_PBBD_MK_AJ_17	38.5	37562.34	2.7	0.1	40	PO_PBBD_MK_AJ_17	39	51503.14041	3	0.15
18	PR_PBBD_KT1_AJ_18	38.5	15936.73	2.7	0.04	41	PO_PBBD_KT1_AJ_18	39	33320.65242	3	0.10
19	PR_PBBD_KG2_AJ_19	37.5	146213.8	2.7	0.39	42	PO_PBBD_KG2_AJ_19	38	230807.8922	3	0.69
20	PR_PBBD_KG2_AJ_20	37.5	51749.52	2.7	0.14	43	PO_PBBD_KG2_AJ_20	38	33118.36508	3	0.10
						44	PO_PBBD_KG2_AJ_21	38	64351.12582	3	0.19
21	PR_PBBD_KG2_AJ_21	37.5	50731.37	2.7	0.14	45	PO_PBBD_KT1_AJ_21A	35	50639.99295	3	0.15
						46	PO_PBBD_KG2_AJ_21B	36	39181.35235	3	0.12
22	PR_PBBD_KG2_AJ_22	33.5	18402.56	2.7	0.05	47	PO_PBBD_KG2_AJ_22	34	22795.05529	3	0.07

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Pre monsoon						Post monsoon					
SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thick ness in m.	Sand Volume in M. Cum	SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thick ness in m.	Sand Volume in M. Cum
23	PR_PBBD_KT1_AJ_23	33.5	8512.577	2.7	0.02	48	PO_PBBD_KT1_AJ_23	34	8940.194503	3	0.03
	PR_PBBD_KG2_AJ_24		0			49	PO_PBBD_KG2_AJ_24	34	28118.04796	3	0.08
	Estimation of	f Sand R	esources in	Pre mor	nsoon perio	od & Pos	t monsoon period in sand bar re	gions of	Hoogly River		
1	PR_PBBD_KT2_HO_01	24	66877.55	2.5	0.17	1	PO_PBBD_KT2_HO_01	0	0	0	0
2	PR_PBBD_PS2_HO_02	24	88265.5	2.5	0.22	2	PO_PBBD_PS2_HO_02	0	0	0	0
3	PR_PBBD_PS2_HO_03	24	52580.75	2.5	0.13	3	PO_PBBD_PS2_HO_03	0	0	0	0
	Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Damodar River										
-	DR DRPD CL1 DA of	66	0016796	2.5	5.79	1	PO_PBBD_GL1_DA_01(IA)	66	130383.346	2.7	1.93
1	PK_PDDD_GLI_DA_01	00	2310/80	2.5	0	2	PO_PBBD_GL1_DA_01(IB)	65	71651.40713	2.7	2.42
		65		2.5	3.91		PO_PBBD_GL1_DA_02(IIA)				
2	PR_PBBD_GL1_DA_02		1563003	2.5	0		PO_PBBD_GL1_DA_02(IIB)				
				2.5	0		PO_PBBD_GL1_DA_02(IIC)				
		58		2.5	27.82		PO_PBBD_GL2_DA_03(IIIA)				
			11127325	2.5	0	3	PO_PBBD_GL2_DA_03(IIIB)	59	195495.8142	2.7	0.53
0	DD DDDD CLo DA co			2.5	0	4	PO_PBBD_GL2_DA_03(IIIC)	57	1351353.509	2.7	3.65
3	rK_rbbD_GL2_DA_03			2.5	0	5	PO_PBBD_GL2_DA_03(IIID)	58	374761.3205	2.7	1.01
				2.5	0	6	PO_PBBD_GL2_DA_03(IIIE)	55	1667864.36	2.7	4.50
				2.5	0	_		( )			14.00
4	PR_PBBD_GL2_DA_04	59	1121896	2.5	2.8	7	PO_PBBD_GL2_DA_03_04	60	5260645.458	2.7	14.20
5	PR_PBBD_GL2_DA_05	57.5	2684532	2.5	6.71	8	PO_PBBD_GL2_DA_05	58	2742629.955	2.7	7.41
6	PR_PBBD_GL2_DA_06	56.5	1016694	2.5	2.54	9	PO_PBBD_GL2_DA_06	57	1170613.716	2.7	3.16
7	PR_PBBD_KH_DA_07	55.5	530903.4	2.5	1.33	10	PO_PBBD_KH_DA_07	56	218041.8979	2.7	0.59
8	PR_PBBD_GL2_DA_08	56.5	194804	2.5	0.49	11	PO_PBBD_GL2_DA_08	57	193147.7291	2.7	0.52
9	PR_PBBD_KH_DA_09	56.5	668181.4	2.5	1.67	12	PO_PBBD_KH_DA_09	57	297318.2333	2.7	0.80
10			1.10(010	2.5	3.74	13	PO_PBBD_BD1_DA_10(XA)	55	115308.9291	2.7	0.31
10	rk_rddu_bu1_uA_10	54.5	1496219	2.5	0	14	PO_PBBD_BD1_DA_10(XB)	54	1061326.786	2.7	2.87
11	PR_PBBD_KH_DA_11	54.5	246141.4	2.5	0.62	15	PO_PBBD_KH_DA_09_11	55	586834.4591	2.7	1.58

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Pre monsoon							Post monsoon				
SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thick ness in m.	Sand Volume in M. Cum	SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thick ness in m.	Sand Volume in M. Cum
				2.5	6.28	16	PO_PBBD_BD1_DA_10_12	55	266503.5816	2.7	0.72
12	PR_PBBD_BD1_DA_12	54.5	2512252	2.5	0	17	PO_PBBD_BD1_DA_12(XIIA)	51	1122156.186	2.7	3.03
				2.5	0	18	PO_PBBD_BD1_DA_12(XIIB)	50	1506780.519	2.7	4.07
						19	PO_PBBD_BDMC_DA_13	50	64048.18627	2.7	0.17
13	PR_PBBD_BD2_DA_13	50	381535.8	2.5	0.95	20	PO_PBBD_BDMC_DA_13(XIIIA)	50	64048.18627	2.7	0.17
						21	PO_PBBD_BD2_DA_13(XIIIB)	47	130723.1277	2.7	0.35
14	PR_PBBD_BD2_DA_14	46.5	620994.2	2.5	1.55	22	PO_PBBD_BD2_DA_14	47	2991195.009	2.7	8.08
						23	PO_PBBD_BD2_DA_15(XVA)	46	2300818.741	2.7	6.21
15	PR_PBBD_BD2_DA_15	45.5	2489071	2.5	6.22	24	PO_PBBD_BD2_DA_15(XVB)	45	525488.8254	2.7	1.42
						25	PO_PBBD_BD2_DA_15A	46	715649.8169	2.7	1.93
16	PR_PBBD_ME1_DA_16	44.5	948177.3	2.5	2.37	26	PO_PBBD_ME1_DA_16	45	550699.7218	2.7	1.49
						27	PO_PBBD_ME1_DA_17	44	289344.5622	2.7	0.78
						28	PO_PBBD_JL_DA_18	44	224926.633	2.7	0.61
						29	PO_PBBD_JL_DA_18C	42	254644	2.7	0.69
						30	PO_PBBD_RN2_DA_19	35	1648436.312	2.7	4.45
	Estimation of Sa	nd Reso	urces in Pro	e monso	on period 8	k Post m	onsoon period in sand bar regior	ns of Dwa	arakeswar Riv	er	
1	PR_PBBD_KH_DW_01	17.5	331691.7	2.5	0.83	1	PO_PBBD_KH_DW_01	39	203264.2285	3	0.61
0	DD DRRD KH DW og	19 5	408087.0	0.5	1.00	2	PO_PBBD_KH_DW_02(IIA)	38	70981.23514	3	0.21
2	rk_rbbd_kh_dw_02	10.5	408087.9	2.5	1.02	3	PO_PBBD_KH_DW_02(IIB)	37	130435.9477	3	0.39
3	PR_PBBD_RN2_DW_03	13.5	117943.4	2.5	0.29	4	PO_PBBD_RN2_DW_03	37	47404.26257	3	0.14
4	PR_PBBD_RN2_DW_04	14.5	47066.22	2.5	0.12	5	PO_PBBD_RN2_DW_04	37	278572.2825	3	0.84
5	PR_PBBD_RN2_DW_05	12.5	397067.3	2.5	0.99	6	PO_PBBD_RN2_DW_05	37	217100.4998	3	0.65
6	PR_PBBD_RN2_DW_06	10.5	99065.18	2.5	0.25	7	PO_PBBD_RN2_DW_06	36	7679.978291	3	0.02



Annexure 3 Boundary Coordinates of Potential Blocks of Purba Bardhaman District

Abbreviation used in the table as below

Annexure-3

*Page A3-1* 



ABBREVIATION FORM								
DEDIOD	PRE	PRE MONSOON						
PERIOD	РО	POST MONSOON						
DISTRICT	ISTRICT PBBD PURBA BARDHA							
	MK	MANGOLKOTE						
	KG1	KETUGRAM 1						
	KG2	KETUGRAM 2						
	KT1	KATWA 1						
	KT2	KATWA 2						
	PS2	PURBASTHALI 2						
	GL1	GALSI 1						
BLOCK	GL2	GALSI 2						
	KH	KHANDAGHOSH						
	BD1	BARDHAMAN 1						
	BD2	BARDHAMAN 2						
	ME1	MEMARI 1						
	RN2	RAINA 2						
		BARDHAMAN						
	BDMC	MUNICIPALITY						
	AJ	AJAY						
DIVED	DA	DAMODAR						
	DW	DWARAKESWAR						
	НО	HOOGLY						

Annexure-3

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CODE	POINT ID	LATITUDE	LONGITUDE						
AJAY RIVER SAND BLOCK									
	1	23° 34' 35.631" N	87° 55' 56.238" E						
	2	23° 34' 41.125" N	87° 55' 54.834" E						
	3	23° 34' 52.031" N	87° 55' 54.997" E						
	4	23° 34' 56.435" N	87° 55' 55.528" E						
PBBD_MK_AJ_01	5	23° 34' 59.304" N	87° 55' 55.197" E						
	6	23° 34' 56.591" N	87° 55' 56.120" E						
	7	23° 34' 48.148" N	87° 55' 56.791" E						
	8	23° 34' 43.989" N	87° 55' 57.074" E						
	9	23° 34' 37.646" N	87° 55' 57.104" E						
	1	23° 34' 14.424" N	87° 55' 30.171" E						
	2	23° 34' 14.825" N	87° 55' 31.246" E						
	3	23° 34' 1.362" N	87° 55' 15.998" E						
	4	23° 34' 1.376" N	87° 55' 15.656" E						
PBBD_MK_AJ_01A	5	23° 34' 2.238" N	87° 55' 14.986" E						
	6	23° 34' 8.610" N	87° 55' 19.869" E						
	7	23° 34' 10.580" N	87° 55' 21.854" E						
	8	23° 34' 12.544" N	87° 55' 25.003" E						
	9	23° 34' 13.936" N	87° 55' 27.029" E						
	1	23° 34' 13.832" N	87° 55' 21.765" E						
	2	23° 34' 14.953" N	87° 55' 22.732" E						
	3	23° 34' 17.373" N	87° 55' 28.446" E						
	4	23° 34' 17.838" N	87° 55' 30.791" E						
	5	23° 34' 17.339" N	87° 55' 30.995" E						
	6	23° 34' 16.842" N	87° 55' 31.395" E						
	7	23° 34' 16.555" N	87° 55' 30.990" E						
	8	23° 34' 16.887" N	87° 55' 30.634" E						
PBBD_MK_AJ_01A_I	9	23° 34' 16.684" N	87° 55' 30.184" E						
	10	23° 34' 15.691" N	87° 55' 30.446" E						
	11	23° 34' 14.867" N	87° 55' 30.127" E						
	12	23° 34' 14.544" N	87° 55' 28.915" E						
	13	23° 34' 15.049" N	87° 55' 27.306" E						
	14	23° 34' 14.807" N	87° 55' 26.408" E						
	15	23° 34' 13.781" N	87° 55' 25.191" E						
	16	23° 34' 13.420" N	87° 55' 23.486" E						
	17	23° 34' 13.469" N	87° 55' 22.232" E						
	1	23° 33' 18.808" N	87° 54' 42.199" E						
	2	23° 33' 22.244" N	87° 54' 42.175" E						
PBBD_MK_AJ_01B	3	23° 33' 24.405" N	87° 54' 42.989" E						
	4	23° 33' 25.650" N	87° 54' 43.072" E						
	5	23° 33' 33.862" N	87° 54' 49.088" E						
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CODE	POINT ID	LATITUDE	LONGITUDE
	6	23° 33' 42.733" N	87° 54' 57.691" E
	7	23° 33' 37.366" N	87° 54' 54.906" E
	8	23° 33' 29.502" N	87° 54' 49.252" E
	9	23° 33' 21.330" N	87° 54' 44.369" E
	1	23° 32' 43.954" N	87° 53' 43.395" E
	2	23° 32' 44.796" N	87° 53' 42.684" E
PBBD_MK_AJ_01C	3	23° 32' 46.509" N	87° 53' 40.834" E
	4	23° 32' 49.570" N	87° 53' 39.208" E
	5	23° 32' 47.705" N	87° 53' 41.491" E
	1	23° 33' 26.441" N	87° 53' 24.177" E
	2	23° 33' 29.211" N	87° 53' 21.246" E
	3	23° 33' 30.243" N	87° 53' 21.216" E
DDDD MK AL 01D	4	23° 33' 30.376" N	87° 53' 22.038" E
IBBD_WIK_AJ_01D	5	23° 33' 29.196" N	87° 53' 26.132" E
	6	23° 33' 28.093" N	87° 53' 27.280" E
	7	23° 33' 26.029" N	87° 53' 29.931" E
	8	23° 33' 22.993" N	87° 53' 29.484" E
	1	23° 33' 21.972" N	87° 53' 29.315" E
	2	23° 33' 15.816" N	87° 53' 28.292" E
	3	23° 33' 9.586" N	87° 53' 27.837" E
	4	23° 33' 12.984" N	87° 53' 26.095" E
	5	23° 33' 15.337" N	87° 53' 23.871" E
	6	23° 33' 16.842" N	87° 53' 19.614" E
	7	23° 33' 19.542" N	87° 53' 19.264" E
PBBD_MK_AJ_01D_I	8	23° 33' 22.032" N	87° 53' 17.153" E
	9	23° 33' 24.654" N	87° 53' 15.976" E
	10	23° 33' 25.858" N	87° 53' 15.984" E
	11	23° 33' 26.336" N	87° 53' 16.659" E
	12	23° 33' 26.119" N	87° 53' 18.524" E
	13	23° 33' 24.650" N	87° 53' 22.658" E
	14	23° 33' 23.640" N	87° 53' 24.779" E
	15	23° 33' 23.875" N	87° 53' 25.863" E
	1	23° 33' 16.448" N	87° 52' 22.875" E
	2	23° 33' 19.094" N	87° 52' 29.597" E
PBBD_MK_AJ_01E	3	23° 33' 20.893" N	87° 52' 39.617" E
	4	23° 33' 14.078" N	87° 52' 42.344" E
	5	23° 33' 13.621" N	87° 52' 28.478" E
	1	23° 33' 20.699" N	87° 52' 19.826" E
PRBD MK ALOIE I	2	23° 33' 26.918" N	87° 52' 27.946" E
I DUD_MIX_AJ_01L_1	3	23° 33' 28.409" N	87° 52' 32.058" E
	4	23° 33' 28.100" N	87° 52' 34.320" E
Annexure-3			Page A3- 4



CODE	POINT ID	LATITUDE	LONGITUDE
	5	23° 33' 23.988" N	87° 52' 36.273" E
	6	23° 33' 23.051" N	87° 52' 38.651" E
PBBD_MK_AJ_01F	1	23° 33' 31.610" N	87° 50' 39.260" E
	2	23° 33' 49.753" N	87° 50' 33.041" E
	3	23° 34' 4.812" N	87° 50' 15.824" E
	4	23° 34' 7.513" N	87° 50' 11.000" E
	5	23° 34' 8.248" N	87° 50' 15.721" E
	6	23° 34' 5.096" N	87° 50' 21.594" E
	7	23° 34' 2.188" N	87° 50' 23.693" E
	8	23° 33' 58.678" N	87° 50' 27.908" E
	9	23° 33' 48.420" N	87° 50' 37.500" E
	10	23° 33' 42.912" N	87° 50' 39.130" E
	11	23° 33' 39.229" N	87° 50' 41.528" E
	12	23° 33' 34.089" N	87° 50' 41.571" E
	13	23° 33' 30.920" N	87° 50' 42.342" E
	14	23° 33' 25.780" N	87° 50' 42.214" E
	15	23° 33' 20.769" N	87° 50' 43.327" E
	16	23° 33' 16.755" N	87° 50' 43.236" E
	17	23° 33' 11.698" N	87° 50' 41.927" E
	18	23° 33' 11.692" N	87° 50' 40.635" E
	19	23° 33' 18.863" N	87° 50' 39.055" E
PBBD_MK_AJ_01G	1	23° 34' 1.399" N	87° 48' 56.635" E
	2	23° 34' 2.075" N	87° 48' 57.962" E
	3	23° 34' 1.807" N	87° 49' 0.304" E
	4	23° 34' 2.874" N	87° 49' 3.074" E
	5	23° 34' 2.659" N	87° 49' 4.211" E
	6	23° 33' 59.549" N	87° 49' 9.552" E
	7	23° 33' 58.850" N	87° 49' 12.425" E
	8	23° 33' 57.965" N	87° 49' 11.189" E
	9	23° 33' 57.678" N	87° 49' 0.268" E
	10	23° 33' 54.526" N	87° 48' 56.143" E
	11	23° 33' 56.633" N	87° 48' 56.605" E
	12	23° 33' 55.183" N	87° 48' 55.395" E
	13	23° 33' 56.163" N	87° 48' 55.679" E
PBBD_MK_AJ_01H	1	23° 33' 43.046" N	87° 48' 39.093" E
	2	23° 33' 45.596" N	87° 48' 41.174" E
	3	23° 33' 47.754" N	87° 48' 45.574" E
	4	23° 33' 47.690" N	87° 48' 45.863" E
	5	23° 33' 44.452" N	87° 48' 41.700" E
PBBD_MK_AJ_01I	1	23° 34' 18.620" N	87° 47' 42.755" E
	2	23° 34' 18.277" N	87° 47' 46.729" E
Annexure-3 Page A3- 5			


CODE	POINT ID	LATITUDE	LONGITUDE
	3	23° 34' 17.856" N	87° 47' 47.461" E
	4	23° 34' 15.327" N	87° 47' 50.060" E
	5	23° 34' 11.737" N	87° 47' 51.984" E
	6	23° 34' 7.691" N	87° 47' 53.397" E
	7	23° 34' 4.824" N	87° 47' 53.103" E
	8	23° 34' 15.455" N	87° 47' 45.057" E
	9	23° 34' 15.980" N	87° 47' 43.958" E
	10	23° 34' 18.122" N	87° 47' 39.322" E
	1	23° 34' 56.414" N	87° 46' 57.948" E
	2	23° 34' 59.909" N	87° 46' 51.060" E
	3	23° 35' 1.553" N	87° 46' 46.281" E
	4	23° 35' 0.814" N	87° 46' 36.482" E
	5	23° 35' 1.245" N	87° 46' 36.693" E
DDDD MV ALOII	6	23° 35' 1.519" N	87° 46' 37.584" E
FBBD_WIK_AJ_01J	7	23° 35' 1.861" N	87° 46' 39.846" E
	8	23° 35' 3.792" N	87° 46' 51.468" E
	9	23° 35' 2.916" N	87° 46' 53.496" E
	10	23° 35' 0.561" N	87° 46' 56.302" E
	11	23° 34' 58.263" N	87° 46' 57.905" E
	12	23° 34' 54.460" N	87° 46' 59.546" E
	1	23° 34' 46.441" N	87° 46' 18.126" E
	2	23° 34' 52.208" N	87° 46' 22.289" E
	3	23° 34' 53.881" N	87° 46' 26.013" E
PBBD MK AI 01K	4	23° 34' 55.997" N	87° 46' 27.352" E
	5	23° 34' 56.150" N	87° 46' 27.813" E
	6	23° 34' 50.599" N	87° 46' 25.294" E
	7	23° 34' 49.395" N	87° 46' 25.375" E
	8	23° 34' 48.449" N	87° 46' 24.520" E
	1	23° 35' 4.579" N	87° 45' 47.256" E
	2	23° 35' 4.640" N	87° 45' 47.688" E
PBBD_MK_AJ_01L	3	23° 35' 6.018" N	87° 45' 48.284" E
	4	23° 34' 57.401" N	87° 45' 52.544" E
	5	23° 34' 56.432" N	87° 45' 52.807" E
	1	23° 35' 6.213" N	87° 45' 46.101" E
PBBD MK AI 01M	2	23° 35' 11.310" N	87° 45' 42.499" E
I DDD_WIK_AJ_UIWI	3	23° 35' 9.616" N	87° 45' 45.257" E
	4	23° 35' 7.817" N	87° 45' 46.079" E
	1	23° 35' 35.355" N	87° 44' 59.225" E
PBBD MK AI 01N	2	23° 35' 34.966" N	87° 45' 0.000" E
	3	23° 35' 34.666" N	87° 45' 4.633" E
	4	23° 35' 33.515" N	87° 45' 6.093" E
Annexure-3			Page A3- 6



CODE	POINT ID	LATITUDE	LONGITUDE
	5	23° 35' 31.819" N	87° 45' 7.223" E
	6	23° 35' 29.146" N	87° 45' 12.363" E
	7	23° 35' 28.372" N	87° 45' 14.041" E
	8	23° 35' 25.124" N	87° 45' 18.093" E
	9	23° 35' 36.761" N	87° 44' 52.085" E
	10	23° 35' 36.804" N	87° 44' 52.421" E
	1	23° 35' 35.027" N	87° 44' 37.477" E
	2	23° 35' 36.951" N	87° 44' 38.030" E
	3	23° 35' 38.801" N	87° 44' 39.263" E
PBBD_MK_AJ_01O	4	23° 35' 39.932" N	87° 44' 41.267" E
	5	23° 35' 40.418" N	87° 44' 43.957" E
	6	23° 35' 40.042" N	87° 44' 47.024" E
	7	23° 35' 35.188" N	87° 44' 39.304" E
	1	23° 35' 30.432" N	87° 43' 55.637" E
	2	23° 35' 27.275" N	87° 43' 55.466" E
	3	23° 35' 28.375" N	87° 43' 54.343" E
	4	23° 35' 29.506" N	87° 43' 53.829" E
PBBD_AS2_AJ_01P	5	23° 35' 32.641" N	87° 43' 53.572" E
	6	23° 35' 34.851" N	87° 43' 53.726" E
	7	23° 35' 37.524" N	87° 43' 54.446" E
	8	23° 35' 37.827" N	87° 43' 54.715" E
	9	23° 35' 35.337" N	87° 43' 55.065" E
	1	23° 35' 41.822" N	87° 43' 54.072" E
	2	23° 35' 42.664" N	87° 43' 53.264" E
PRRD AS2 AL 010	3	23° 35' 44.719" N	87° 43' 52.647" E
1000_A52_A1_01Q	4	23° 35' 45.490" N	87° 43' 52.904" E
	5	23° 35' 45.490" N	87° 43' 53.405" E
	6	23° 35' 44.541" N	87° 43' 53.832" E
	1	23° 35' 49.432" N	87° 43' 44.602" E
	2	23° 35' 53.361" N	87° 43' 39.969" E
PRRD AS2 AL 01R	3	23° 35' 53.765" N	87° 43' 39.592" E
IDDD_AS2_AJ_01K	4	23° 35' 54.022" N	87° 43' 40.620" E
	5	23° 35' 53.817" N	87° 43' 41.443" E
	6	23° 35' 50.938" N	87° 43' 44.064" E
	1	23° 36' 10.191" N	87° 43' 23.203" E
	2	23° 36' 9.452" N	87° 43' 23.203" E
	3	23° 36' 9.644" N	87° 43' 22.388" E
PBBD_AS2_AJ_01S	4	23° 36' 12.686" N	87° 43' 19.924" E
	5	23° 36' 21.171" N	87° 43' 17.821" E
	6	23° 36' 20.097" N	87° 43' 18.537" E
	7	23° 36' 18.590" N	87° 43' 18.880" E
Annexure-3			<i>Page A3- 7</i>



CODE	POINT ID	LATITUDE	LONGITUDE
	8	23° 36' 18.287" N	87° 43' 19.538" E
	9	23° 36' 12.597" N	87° 43' 21.597" E
	1	23° 37' 0.513" N	87° 42' 55.230" E
	2	23° 36' 58.878" N	87° 42' 59.304" E
	3	23° 36' 56.994" N	87° 43' 0.417" E
	4	23° 36' 53.417" N	87° 43' 1.069" E
	5	23° 36' 52.237" N	87° 43' 3.050" E
	6	23° 36' 49.839" N	87° 43' 5.448" E
	7	23° 36' 48.837" N	87° 43' 5.559" E
	8	23° 36' 44.973" N	87° 43' 8.806" E
	9	23° 36' 42.575" N	87° 43' 10.040" E
	10	23° 36' 40.245" N	87° 43' 10.382" E
	11	23° 36' 39.011" N	87° 43' 10.999" E
PBBD_AS2_AJ_011	12	23° 36' 36.080" N	87° 43' 10.915" E
	13	23° 36' 39.926" N	87° 43' 5.996" E
	14	23° 36' 43.061" N	87° 43' 4.865" E
	15	23° 36' 51.182" N	87° 42' 59.263" E
	16	23° 36' 53.940" N	87° 42' 54.684" E
	17	23° 36' 56.167" N	87° 42' 50.988" E
	18	23° 36' 56.879" N	87° 42' 43.636" E
	19	23° 37' 0.639" N	87° 42' 23.594" E
	20	23° 37' 2.056" N	87° 42' 32.718" E
	21	23° 37' 0.142" N	87° 42' 37.283" E
	22	23° 37' 0.800" N	87° 42' 44.009" E
	1	23° 36' 57.565" N	87° 39' 54.652" E
	2	23° 37' 3.026" N	87° 39' 58.053" E
	3	23° 37' 10.357" N	87° 40' 5.498" E
	4	23° 37' 12.327" N	87° 40' 11.923" E
	5	23° 37' 12.749" N	87° 40' 21.824" E
	6	23° 37' 13.605" N	87° 40' 25.465" E
PBBD_AS2_AJ_01U	7	23° 37' 14.090" N	87° 40' 32.284" E
	8	23° 37' 13.117" N	87° 40' 40.581" E
	9	23° 37' 4.616" N	87° 40' 47.084" E
	10	23° 37' 8.297" N	87° 40' 39.670" E
	11	23° 37' 7.090" N	87° 40' 20.474" E
	12	23° 37' 1.107" N	87° 40' 3.413" E
	13	23° 36' 57.707" N	87° 39' 56.068" E
	1	23° 36' 57.919" N	87° 39' 46.786" E
	2	23° 37' 0.213" N	87° 39' 46.818" E
PBBD_AS2_AJ_01V	3	23° 37' 8.848" N	87° 39' 53.705" E
	4	23° 37' 11.829" N	87° 39' 58.485" E
Annexure-3			Page A3- 8



CODE	POINT ID	LATITUDE	LONGITUDE
	5	23° 37' 13.231" N	87° 40' 3.320" E
	6	23° 37' 12.577" N	87° 40' 3.664" E
	7	23° 37' 11.035" N	87° 40' 3.621" E
	8	23° 37' 9.843" N	87° 39' 57.018" E
	9	23° 37' 2.469" N	87° 39' 51.586" E
	10	23° 37' 1.270" N	87° 39' 51.329" E
	1	23° 36' 20.881" N	87° 38' 34.406" E
	2	23° 36' 20.967" N	87° 38' 36.376" E
	3	23° 36' 20.239" N	87° 38' 40.359" E
	4	23° 36' 18.703" N	87° 38' 44.508" E
	5	23° 36' 20.832" N	87° 38' 47.897" E
	6	23° 36' 18.236" N	87° 38' 53.917" E
	7	23° 36' 19.798" N	87° 39' 16.704" E
	8	23° 36' 18.874" N	87° 39' 18.843" E
PBDD_AS2_AJ_01W	9	23° 36' 16.639" N	87° 39' 20.592" E
	10	23° 36' 14.533" N	87° 39' 16.926" E
	11	23° 36' 14.028" N	87° 39' 14.367" E
	12	23° 36' 12.401" N	87° 39' 8.756" E
	13	23° 36' 12.401" N	87° 39' 6.357" E
	14	23° 36' 12.064" N	87° 39' 3.479" E
	15	23° 36' 16.968" N	87° 38' 47.562" E
	16	23° 36' 21.010" N	87° 38' 33.421" E
	1	23° 36' 33.259" N	87° 38' 22.371" E
	2	23° 36' 31.203" N	87° 38' 26.654" E
	3	23° 36' 31.289" N	87° 38' 27.682" E
	4	23° 36' 30.518" N	87° 38' 29.523" E
	5	23° 36' 30.614" N	87° 38' 30.326" E
	6	23° 36' 27.179" N	87° 38' 36.534" E
	7	23° 36' 28.119" N	87° 38' 29.737" E
PBBD_AS2_AJ_01X	8	23° 36' 27.698" N	87° 38' 23.991" E
	9	23° 36' 26.841" N	87° 38' 20.993" E
	10	23° 36' 26.755" N	87° 38' 18.080" E
	11	23° 36' 28.640" N	87° 38' 13.968" E
	12	23° 36' 30.867" N	87° 38' 11.656" E
	13	23° 36' 34.288" N	87° 38' 10.663" E
	14	23° 36' 34.630" N	87° 38' 16.503" E
	15	23° 36' 34.501" N	87° 38' 19.244" E
	1	23° 36' 27.900" N	87° 37' 51.564" E
PRRD AS2 AT 01V	2	23° 36' 30.907" N	87° 37' 54.545" E
PBBD_AS2_AJ_01Y	3	23° 36' 32.609" N	87° 37' 58.320" E
	4	23° 36' 29.668" N	87° 38' 4.460" E
Annexure-3			Page A3- 9



CODE	POINT ID	LATITUDE	LONGITUDE
	5	23° 36' 28.691" N	87° 38' 4.966" E
	6	23° 36' 28.536" N	87° 38' 6.564" E
	7	23° 36' 24.897" N	87° 38' 8.881" E
	8	23° 36' 24.172" N	87° 38' 11.268" E
	9	23° 36' 22.479" N	87° 38' 12.703" E
	10	23° 36' 23.274" N	87° 38' 7.075" E
	11	23° 36' 23.017" N	87° 38' 0.239" E
	12	23° 36' 15.792" N	87° 37' 24.247" E
	13	23° 36' 15.065" N	87° 37' 12.452" E
	14	23° 36' 15.987" N	87° 37' 16.079" E
	15	23° 36' 17.174" N	87° 37' 19.394" E
	16	23° 36' 17.759" N	87° 37' 23.151" E
	17	23° 36' 19.514" N	87° 37' 27.666" E
	18	23° 36' 19.417" N	87° 37' 36.202" E
	19	23° 36' 19.595" N	87° 37' 39.130" E
	20	23° 36' 20.863" N	87° 37' 43.662" E
	21	23° 36' 22.456" N	87° 37' 46.643" E
	22	23° 36' 24.943" N	87° 37' 49.677" E
	1	23° 35' 55.969" N	87° 36' 3.917" E
	2	23° 35' 58.116" N	87° 36' 3.302" E
	3	23° 36' 1.963" N	87° 36' 8.451" E
	4	23° 36' 5.424" N	87° 36' 22.394" E
FBBD_AS2_AJ_011_1	5	23° 36' 4.007" N	87° 36' 18.204" E
	6	23° 36' 0.929" N	87° 36' 13.305" E
	7	23° 35' 59.540" N	87° 36' 9.445" E
	8	23° 35' 57.034" N	87° 36' 6.028" E
	1	23° 35' 46.269" N	87° 35' 39.343" E
	2	23° 35' 47.664" N	87° 35' 41.095" E
	3	23° 35' 47.694" N	87° 35' 42.215" E
	4	23° 35' 47.000" N	87° 35' 43.781" E
	5	23° 35' 47.204" N	87° 35' 44.416" E
	6	23° 35' 48.100" N	87° 35' 44.159" E
	7	23° 35' 48.919" N	87° 35' 45.955" E
PBBD_AS2_AJ_01Y_II	8	23° 35' 49.638" N	87° 35' 46.929" E
	9	23° 35' 50.820" N	87° 35' 52.685" E
	10	23° 35' 51.535" N	87° 35' 54.780" E
	11	23° 35' 51.427" N	87° 35' 56.086" E
	12	23° 35' 50.872" N	87° 35' 56.980" E
	13	23° 35' 50.217" N	87° 35' 57.388" E
	14	23° 35' 49.971" N	87° 35' 58.694" E
	15	23° 35' 49.999" N	87° 36' 0.262" E
Annexure-3			Page A3- 10



CODE	POINT ID	LATITUDE	LONGITUDE
	16	23° 35' 50.578" N	87° 36' 1.908" E
	17	23° 35' 51.538" N	87° 36' 2.958" E
	18	23° 35' 51.777" N	87° 36' 3.295" E
	19	23° 35' 51.441" N	87° 36' 3.664" E
	20	23° 35' 49.815" N	87° 36' 0.434" E
	21	23° 35' 46.679" N	87° 35' 44.809" E
	1	23° 35' 51.436" N	87° 35' 44.809" E
	2	23° 35' 51.854" N	87° 35' 43.280" E
	3	23° 35' 51.618" N	87° 35' 42.084" E
	4	23° 35' 51.943" N	87° 35' 39.346" E
	5	23° 35' 52.170" N	87° 35' 39.572" E
	6	23° 35' 52.781" N	87° 35' 47.671" E
	7	23° 35' 52.318" N	87° 35' 49.367" E
	8	23° 35' 55.035" N	87° 35' 58.178" E
	9	23° 35' 54.131" N	87° 35' 59.796" E
	10	23° 35' 54.330" N	87° 36' 1.776" E
PBBD_AS2_AJ_01Y_III	11	23° 35' 53.022" N	87° 36' 1.732" E
	12	23° 35' 52.436" N	87° 36' 2.028" E
	13	23° 35' 51.920" N	87° 36' 1.914" E
	14	23° 35' 51.511" N	87° 36' 0.941" E
	15	23° 35' 51.105" N	87° 35' 59.110" E
	16	23° 35' 51.283" N	87° 35' 57.505" E
	17	23° 35' 52.184" N	87° 35' 55.940" E
	18	23° 35' 51.854" N	87° 35' 52.354" E
	19	23° 35' 51.244" N	87° 35' 49.812" E
	20	23° 35' 52.081" N	87° 35' 47.015" E
	1	23° 36' 24.802" N	87° 33' 42.671" E
	2	23° 36' 23.637" N	87° 33' 45.116" E
	3	23° 36' 21.096" N	87° 33' 47.137" E
	4	23° 36' 20.097" N	87° 33' 49.463" E
	5	23° 36' 18.879" N	87° 33' 51.370" E
	6	23° 36' 15.625" N	87° 33' 52.849" E
	7	23° 36' 13.581" N	87° 33' 54.573" E
PBBD_AS2_AJ_01Z	8	23° 36' 11.236" N	87° 33' 55.078" E
	9	23° 36' 14.639" N	87° 33' 50.555" E
	10	23° 36' 15.230" N	87° 33' 47.307" E
	11	23° 36' 18.873" N	87° 33' 41.073" E
	12	23° 36' 20.601" N	87° 33' 37.758" E
	13	23° 36' 23.582" N	87° 33' 29.740" E
	14	23° 36' 23.325" N	87° 33' 27.376" E
	15	23° 36' 28.000" N	87° 33' 9.584" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	16	23° 36' 28.546" N	87° 33' 11.974" E
	17	23° 36' 29.148" N	87° 33' 13.052" E
	18	23° 36' 28.762" N	87° 33' 16.948" E
	19	23° 36' 29.071" N	87° 33' 19.087" E
	20	23° 36' 30.826" N	87° 33' 21.006" E
	21	23° 36' 30.983" N	87° 33' 23.397" E
	22	23° 36' 30.144" N	87° 33' 27.098" E
	23	23° 36' 28.645" N	87° 33' 30.498" E
	24	23° 36' 28.193" N	87° 33' 33.603" E
	25	23° 36' 27.302" N	87° 33' 36.527" E
	26	23° 36' 24.921" N	87° 33' 40.222" E
	1	23° 36' 30.561" N	87° 33' 17.933" E
	2	23° 36' 30.432" N	87° 33' 15.449" E
	3	23° 36' 30.903" N	87° 33' 14.249" E
	4	23° 36' 30.903" N	87° 33' 12.665" E
	5	23° 36' 33.173" N	87° 33' 10.138" E
PBDD_AS2_AJ_01Z_1	6	23° 36' 35.330" N	87° 33' 7.062" E
	7	23° 36' 35.402" N	87° 33' 7.583" E
	8	23° 36' 34.463" N	87° 33' 10.141" E
	9	23° 36' 32.183" N	87° 33' 20.489" E
	10	23° 36' 31.032" N	87° 33' 18.404" E
	1	23° 37' 46.698" N	87° 57' 39.394" E
	2	23° 37' 46.086" N	87° 57' 37.537" E
	3	23° 37' 44.308" N	87° 57' 38.976" E
	4	23° 37' 43.022" N	87° 57' 34.729" E
	5	23° 37' 41.357" N	87° 57' 32.798" E
	6	23° 37' 35.332" N	87° 57' 25.815" E
	7	23° 37' 11.689" N	87° 57' 9.564" E
	8	23° 37' 1.667" N	87° 57' 7.611" E
	9	23° 36' 44.192" N	87° 57' 3.602" E
DDDD MK AL 02	10	23° 36' 38.384" N	87° 57' 3.911" E
FBBD_MIK_AJ_05	11	23° 36' 33.296" N	87° 57' 3.294" E
	12	23° 36' 21.755" N	87° 56' 59.607" E
	13	23° 36' 18.256" N	87° 56' 57.410" E
	14	23° 36' 17.522" N	87° 56' 55.971" E
	15	23° 36' 17.937" N	87° 56' 55.615" E
	16	23° 36' 18.515" N	87° 56' 55.709" E
	17	23° 36' 18.883" N	87° 56' 56.205" E
	18	23° 36' 20.775" N	87° 56' 57.383" E
	19	23° 36' 25.680" N	87° 56' 58.853" E
	20	23° 36' 29.934" N	87° 56' 58.794" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	21	23° 36' 31.144" N	87° 56' 56.741" E
	22	23° 36' 35.443" N	87° 56' 56.100" E
	23	23° 36' 37.418" N	87° 56' 57.190" E
	24	23° 36' 38.980" N	87° 56' 57.103" E
	25	23° 36' 55.147" N	87° 57' 5.302" E
	26	23° 36' 58.169" N	87° 57' 6.097" E
	27	23° 37' 2.704" N	87° 57' 6.364" E
	28	23° 37' 17.849" N	87° 57' 10.130" E
	29	23° 37' 22.222" N	87° 57' 7.240" E
	30	23° 37' 25.162" N	87° 57' 10.008" E
	31	23° 37' 29.564" N	87° 57' 13.689" E
	32	23° 37' 30.620" N	87° 57' 14.254" E
	33	23° 37' 32.496" N	87° 57' 17.097" E
	34	23° 37' 33.787" N	87° 57' 17.312" E
	35	23° 37' 36.731" N	87° 57' 20.041" E
	36	23° 37' 38.954" N	87° 57' 24.811" E
	37	23° 37' 42.634" N	87° 57' 29.069" E
	38	23° 37' 43.331" N	87° 57' 27.033" E
	39	23° 37' 40.606" N	87° 57' 25.505" E
	40	23° 37' 40.016" N	87° 57' 22.991" E
	41	23° 37' 36.798" N	87° 57' 18.008" E
	42	23° 37' 38.079" N	87° 57' 15.687" E
	43	23° 37' 41.497" N	87° 57' 14.935" E
	44	23° 37' 44.939" N	87° 57' 16.496" E
	45	23° 37' 44.531" N	87° 57' 19.830" E
	46	23° 37' 50.824" N	87° 57' 32.904" E
	47	23° 37' 50.844" N	87° 57' 39.768" E
	48	23° 37' 49.445" N	87° 57' 40.102" E
	1	23° 36' 27.712" N	87° 56' 57.523" E
	2	23° 36' 20.292" N	87° 56' 55.453" E
	3	23° 36' 19.713" N	87° 56' 54.894" E
	4	23° 36' 25.305" N	87° 56' 54.465" E
PBBD_MK_AJ_03A	5	23° 36' 33.803" N	87° 56' 55.283" E
	6	23° 36' 32.429" N	87° 56' 56.033" E
	7	23° 36' 29.288" N	87° 56' 56.369" E
	8	23° 36' 29.781" N	87° 56' 56.776" E
	9	23° 36' 29.282" N	87° 56' 57.310" E
	1	23° 37' 38.516" N	87° 57' 11.897" E
DDDD MIZ AL 02D	2	23° 37' 36.701" N	87° 57' 11.481" E
LDDD <sup>_IMIV_</sup> WIV <sup>_</sup> WIV <sup>_</sup> U3D	3	23° 37' 35.628" N	87° 57' 11.428" E
	4	23° 37' 33.856" N	87° 57' 10.833" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	5	23° 37' 32.617" N	87° 57' 10.824" E
	6	23° 37' 32.282" N	87° 57' 11.628" E
	7	23° 37' 30.636" N	87° 57' 10.764" E
	8	23° 37' 30.102" N	87° 57' 10.223" E
	9	23° 37' 29.647" N	87° 57' 10.354" E
	10	23° 37' 28.621" N	87° 57' 9.316" E
	11	23° 37' 27.716" N	87° 57' 8.771" E
	12	23° 37' 26.976" N	87° 57' 8.183" E
	13	23° 37' 26.942" N	87° 57' 7.018" E
	14	23° 37' 27.671" N	87° 57' 6.518" E
	15	23° 37' 27.991" N	87° 57' 6.576" E
	16	23° 37' 28.854" N	87° 57' 6.732" E
	17	23° 37' 29.563" N	87° 57' 6.966" E
	18	23° 37' 31.428" N	87° 57' 7.580" E
	19	23° 37' 36.528" N	87° 57' 9.870" E
	20	23° 37' 38.648" N	87° 57' 11.040" E
	21	23° 37' 39.356" N	87° 57' 11.431" E
	22	23° 37' 38.516" N	87° 57' 11.897" E
	1	23° 37' 56.070" N	87° 57' 30.211" E
	2	23° 37' 56.444" N	87° 57' 37.654" E
	3	23° 37' 54.607" N	87° 57' 42.589" E
	4	23° 37' 50.463" N	87° 57' 51.896" E
	5	23° 37' 49.398" N	87° 57' 57.164" E
	6	23° 37' 48.900" N	87° 58' 10.181" E
	7	23° 37' 50.588" N	87° 58' 26.959" E
	8	23° 37' 56.394" N	87° 58' 35.521" E
	9	23° 37' 51.240" N	87° 58' 34.969" E
	10	23° 37' 50.396" N	87° 58' 33.046" E
PBBD KG1 AI 04	11	23° 37' 49.471" N	87° 58' 25.433" E
	12	23° 37' 47.909" N	87° 58' 21.374" E
	13	23° 37' 47.883" N	87° 58' 18.909" E
	14	23° 37' 46.760" N	87° 58' 13.612" E
	15	23° 37' 47.056" N	87° 58' 5.771" E
	16	23° 37' 47.120" N	87° 58' 2.231" E
	17	23° 37' 48.557" N	87° 57' 56.953" E
	18	23° 37' 48.507" N	87° 57' 51.663" E
	19	23° 37' 48.938" N	87° 57' 48.882" E
	20	23° 37' 51.040" N	87° 57' 44.525" E
	21	23° 37' 52.029" N	87° 57' 39.486" E
	22	23° 37' 53.250" N	87° 57' 35.712" E
PBBD_KG1_AJ_05_06	1	23° 37' 50.325" N	87° 57' 44.400" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	2	23° 37' 47.503" N	87° 57' 47.629" E
	3	23° 37' 46.525" N	87° 57' 49.483" E
	4	23° 37' 47.269" N	87° 57' 53.306" E
	5	23° 37' 48.156" N	87° 57' 54.731" E
	6	23° 37' 47.767" N	87° 57' 57.753" E
	7	23° 37' 46.418" N	87° 58' 2.270" E
	8	23° 37' 46.168" N	87° 58' 6.686" E
	9	23° 37' 45.016" N	87° 58' 12.763" E
	10	23° 37' 43.517" N	87° 58' 17.174" E
	11	23° 37' 43.997" N	87° 58' 19.508" E
	12	23° 37' 45.433" N	87° 58' 21.042" E
	13	23° 37' 45.425" N	87° 58' 28.930" E
	14	23° 37' 46.811" N	87° 58' 31.809" E
	15	23° 37' 49.145" N	87° 58' 34.745" E
	16	23° 37' 46.268" N	87° 58' 34.437" E
	17	23° 37' 42.402" N	87° 58' 27.447" E
	18	23° 37' 41.207" N	87° 58' 20.529" E
	19	23° 37' 43.101" N	87° 58' 9.226" E
	20	23° 37' 43.440" N	87° 57' 59.032" E
	21	23° 37' 44.995" N	87° 57' 48.931" E
	22	23° 37' 45.088" N	87° 57' 43.059" E
	23	23° 37' 44.308" N	87° 57' 38.976" E
	24	23° 37' 46.086" N	87° 57' 37.537" E
	25	23° 37' 46.698" N	87° 57' 39.394" E
	26	23° 37' 49.445" N	87° 57' 40.102'' E
	27	23° 37' 50.844" N	87° 57' 39.768" E
	1	23° 37' 56.394" N	87° 58' 35.521" E
	2	23° 37' 58.986" N	87° 58' 38.697" E
	3	23° 38' 0.929" N	87° 58' 40.853" E
PBBD MK AI 07 08	4	23° 38' 5.458" N	87° 58' 44.425" E
TDDD_WIK_AJ_07_00	5	23° 38' 6.042" N	87° 58' 46.859" E
	6	23° 37' 56.227" N	87° 58' 40.290" E
	7	23° 37' 54.146" N	87° 58' 38.542" E
	8	23° 37' 51.240" N	87° 58' 34.969" E
	1	23° 38' 17.911" N	87° 58' 52.841" E
	2	23° 38' 27.220" N	87° 59' 3.556" E
	3	23° 38' 28.916" N	87° 59' 7.444" E
PBBD_KG1_AJ_09_10	4	23° 38' 30.038" N	87° 59' 13.708" E
	5	23° 38' 29.571" N	87° 59' 19.401" E
	6	23° 38' 28.175" N	87° 59' 22.426" E
	7	23° 38' 25.883" N	87° 59' 24.416" E
Annexure-3			Page A3- 15



CODE	POINT ID	LATITUDE	LONGITUDE
	8	23° 38' 23.904" N	87° 59' 25.405" E
	9	23° 38' 26.842" N	87° 59' 19.532" E
	10	23° 38' 26.999" N	87° 59' 16.545" E
	11	23° 38' 24.574" N	87° 59' 8.160" E
	12	23° 38' 22.385" N	87° 59' 6.127" E
	13	23° 38' 19.978" N	87° 59' 5.810" E
	14	23° 38' 16.572" N	87° 59' 0.331" E
	15	23° 38' 16.179" N	87° 58' 57.116" E
	16	23° 38' 14.134" N	87° 58' 54.038" E
	17	23° 38' 9.963" N	87° 58' 49.735" E
	18	23° 38' 6.042" N	87° 58' 46.859" E
	19	23° 38' 5.458" N	87° 58' 44.425" E
	20	23° 38' 14.437" N	87° 58' 51.274" E
	1	23° 38' 20.567" N	87° 59' 21.367" E
	2	23° 38' 16.343" N	87° 59' 25.429" E
	3	23° 38' 14.344" N	87° 59' 25.937" E
PBBD_KG1_AJ_09_10_1	4	23° 38' 11.114" N	87° 59' 25.241" E
	5	23° 38' 6.674" N	87° 59' 25.150" E
	6	23° 38' 8.677" N	87° 59' 24.303" E
	1	23° 38' 0.842" N	87° 59' 34.778" E
	2	23° 38' 0.867" N	87° 59' 39.367" E
	3	23° 38' 5.715" N	87° 59' 50.683" E
	4	23° 38' 5.818" N	87° 59' 56.161" E
	5	23° 38' 17.312" N	88° 0' 18.960" E
PRD VC1 AL 11	6	23° 38' 13.238" N	88° 0' 15.404" E
FBBD_K01_AJ_11	7	23° 38' 8.378" N	88° 0' 7.591" E
	8	23° 38' 3.821" N	88° 0' 1.220" E
	9	23° 38' 4.189" N	87° 59' 55.776" E
	10	23° 37' 56.248" N	87° 59' 42.963" E
	11	23° 37' 55.441" N	87° 59' 39.644" E
	12	23° 37' 57.649" N	87° 59' 36.479" E
	1	23° 38' 19.081" N	88° 0' 22.361" E
	2	23° 38' 19.376" N	88° 0' 23.239" E
	3	23° 38' 17.748" N	88° 0' 22.732" E
PRED KC1 AL 11A	4	23° 38' 17.729" N	88° 0' 25.690" E
PBBD_KG1_AJ_11A	5	23° 38' 16.954" N	88° 0' 26.401" E
	6	23° 38' 15.764" N	88° 0' 23.016" E
	7	23° 38' 15.479" N	88° 0' 20.354" E
	8	23° 38' 17.952" N	88° 0' 21.090" E
PRRD MK AT 12	1	23° 38' 3.033" N	87° 59' 57.039" E
יייין אווע_הו_12	2	23° 38' 3.821" N	88° 0' 1.220" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	3	23° 38' 4.189" N	87° 59' 55.776" E
	4	23° 37' 56.248" N	87° 59' 42.963" E
	5	23° 37' 58.415" N	87° 59' 49.519" E
	1	23° 38' 13.937" N	88° 0' 59.627" E
	2	23° 38' 14.460" N	88° 1' 1.692" E
	3	23° 38' 14.611" N	88° 1' 3.890" E
	4	23° 38' 15.832" N	88° 1' 6.678" E
	5	23° 38' 15.623" N	88° 1' 7.035" E
	6	23° 38' 14.228" N	88° 1' 5.680" E
	7	23° 38' 13.045" N	88° 1' 3.385" E
PBBD_KG2_AJ_14	8	23° 38' 12.504" N	88° 1' 3.248" E
	9	23° 38' 12.659" N	88° 1' 1.520" E
	10	23° 38' 12.395" N	88° 0' 59.763" E
	11	23° 38' 13.292" N	88° 0' 48.863" E
	12	23° 38' 14.507" N	88° 0' 40.995" E
	13	23° 38' 14.422" N	88° 0' 47.072" E
	14	23° 38' 15.202" N	88° 0' 51.517" E
	15	23° 38' 15.208" N	88° 0' 54.232" E
	1	23° 38' 12.502" N	88° 1' 6.159" E
	2	23° 38' 13.888" N	88° 1' 7.099" E
	3	23° 38' 15.888" N	88° 1' 9.337" E
	4	23° 38' 22.280" N	88° 1' 21.190" E
PBBD_KG2_AJ_14A	5	23° 38' 22.526" N	88° 1' 22.970" E
	6	23° 38' 22.447" N	88° 1' 24.198" E
	7	23° 38' 21.558" N	88° 1' 24.844" E
	8	23° 38' 18.108" N	88° 1' 20.537" E
	9	23° 38' 13.746" N	88° 1' 14.154" E
	1	23° 38' 24.223" N	88° 1' 22.234" E
	2	23° 38' 26.212" N	88° 1' 26.047" E
	3	23° 38' 27.712" N	88° 1' 30.240" E
PPPD KG2 AL 14P	4	23° 38' 26.952" N	88° 1' 29.803" E
	5	23° 38' 26.504" N	88° 1' 28.903" E
	6	23° 38' 25.517" N	88° 1' 28.268" E
	7	23° 38' 24.125" N	88° 1' 26.419" E
	8	23° 38' 23.520" N	88° 1' 24.263" E
	1	23° 38' 23.146" N	88° 1' 29.428" E
	2	23° 38' 24.634" N	88° 1' 30.844" E
PRRD KG2 AT 15	3	23° 38' 26.389" N	88° 1' 35.047" E
PBBD_KG2_AJ_15	4	23° 38' 27.140" N	88° 1' 38.041" E
	5	23° 38' 27.014" N	88° 1' 40.431" E
	6	23° 38' 23.495" N	88° 1' 47.993" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	7	23° 38' 21.444" N	88° 1' 50.128" E
	8	23° 38' 17.962" N	88° 1' 52.193" E
	9	23° 38' 16.146" N	88° 1' 52.790" E
	10	23° 38' 7.862" N	88° 1' 52.350" E
	11	23° 38' 14.607" N	88° 1' 50.428" E
	12	23° 38' 20.870" N	88° 1' 46.322" E
	13	23° 38' 22.672" N	88° 1' 44.431" E
	14	23° 38' 24.014" N	88° 1' 41.974" E
	15	23° 38' 24.392" N	88° 1' 33.024" E
	1	23° 38' 9.692" N	88° 2' 23.769" E
	2	23° 38' 4.770" N	88° 2' 24.072" E
	3	23° 38' 3.494" N	88° 2' 23.334" E
	4	23° 38' 0.863" N	88° 2' 13.333" E
	5	23° 38' 1.250" N	88° 2' 4.791" E
PBBD_KG2_AJ_10	6	23° 38' 5.351" N	88° 1' 59.373" E
	7	23° 38' 4.370" N	88° 2' 2.019" E
	8	23° 38' 3.377" N	88° 2' 6.493" E
	9	23° 38' 3.472" N	88° 2' 12.769" E
	10	23° 38' 6.048" N	88° 2' 20.722" E
	1	23° 38' 9.692" N	88° 2' 23.769" E
	2	23° 38' 3.347" N	88° 2' 24.160" E
	3	23° 38' 2.103" N	88° 2' 24.290" E
	4	23° 38' 0.933" N	88° 2' 23.338" E
	5	23° 37' 58.924" N	88° 2' 20.111" E
	6	23° 37' 55.764" N	88° 2' 14.147" E
DDDD MK AL 17	7	23° 37' 55.735" N	88° 2' 14.073" E
FDDD_WIK_AJ_17	8	23° 38' 4.811" N	88° 2' 19.924" E
	9	23° 38' 3.909" N	88° 2' 19.343" E
	10	23° 38' 5.115" N	88° 2' 20.121" E
	11	23° 38' 5.117" N	88° 2' 20.122" E
	12	23° 38' 5.757" N	88° 2' 20.534" E
	13	23° 38' 7.301" N	88° 2' 21.972" E
	14	23° 38' 9.569" N	88° 2' 23.717" E
	1	23° 38' 2.103" N	88° 2' 24.290" E
	2	23° 38' 3.347" N	88° 2' 24.160" E
	3	23° 38' 9.692" N	88° 2' 23.769" E
DRRD KT1 AT 19	4	23° 38' 12.824" N	88° 2' 25.091" E
PRRD_R11_A7_18	5	23° 38' 15.229" N	88° 2' 26.642" E
	6	23° 38' 15.284" N	88° 2' 26.784" E
	7	23° 38' 15.560" N	88° 2' 27.489" E
	8	23° 38' 15.655" N	88° 2' 27.733" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	9	23° 38' 12.437" N	88° 2' 27.370" E
	10	23° 38' 9.408" N	88° 2' 27.421" E
	11	23° 38' 8.883" N	88° 2' 27.412" E
	12	23° 38' 7.687" N	88° 2' 27.052" E
	13	23° 38' 4.872" N	88° 2' 26.021" E
	14	23° 38' 3.020" N	88° 2' 25.036" E
	1	23° 38' 15.517" N	88° 2' 26.331" E
	2	23° 38' 18.831" N	88° 2' 28.039" E
	3	23° 38' 31.002" N	88° 2' 32.468" E
	4	23° 38' 34.366" N	88° 2' 35.632" E
	5	23° 38' 36.062" N	88° 2' 41.428" E
	6	23° 38' 36.137" N	88° 2' 44.525" E
	7	23° 38' 32.913" N	88° 3' 3.089" E
	8	23° 38' 31.460" N	88° 3' 4.629" E
PBBD_KG2_AJ_19	9	23° 38' 30.962" N	88° 3' 4.489" E
	10	23° 38' 31.488" N	88° 2' 59.251" E
	11	23° 38' 30.759" N	88° 2' 50.019" E
	12	23° 38' 29.842" N	88° 2' 44.971" E
	13	23° 38' 27.493" N	88° 2' 39.470" E
	14	23° 38' 26.284" N	88° 2' 37.932" E
	15	23° 38' 25.119" N	88° 2' 36.450" E
	16	23° 38' 16.801" N	88° 2' 30.667" E
	17	23° 38' 15.284" N	88° 2' 26.784" E
	1	23° 38' 30.972" N	88° 3' 11.568" E
	2	23° 38' 30.265" N	88° 3' 16.461" E
	3	23° 38' 31.420" N	88° 3' 19.906" E
	4	23° 38' 33.533" N	88° 3' 23.511" E
	5	23° 38' 34.894" N	88° 3' 23.746" E
	6	23° 38' 37.589" N	88° 3' 22.795" E
	7	23° 38' 42.104" N	88° 3' 25.476" E
	8	23° 38' 43.144" N	88° 3' 27.426" E
PBBD_KT1_AJ_20A	9	23° 38' 41.829" N	88° 3' 26.519" E
	10	23° 38' 40.336" N	88° 3' 27.403" E
	11	23° 38' 38.002" N	88° 3' 26.578" E
	12	23° 38' 37.359" N	88° 3' 27.457" E
	13	23° 38' 33.648" N	88° 3' 25.751" E
	14	23° 38' 29.989" N	88° 3' 22.472" E
	15	23° 38' 29.614" N	88° 3' 12.874" E
	16	23° 38' 30.179" N	88° 3' 11.036" E
	17	23° 38' 30.759" N	88° 3' 10.832" E
PBBD_KT1_AJ_21	1	23° 39' 2.016" N	88° 4' 55.736" E
Annexure-3			Page A3- 19



CODE	POINT ID	LATITUDE	LONGITUDE
	2	23° 39' 1.241" N	88° 4' 54.812" E
	3	23° 39' 5.804" N	88° 4' 54.270" E
	4	23° 39' 12.667" N	88° 5' 0.240" E
	5	23° 39' 15.960" N	88° 5' 1.792" E
	6	23° 39' 26.118" N	88° 5' 5.701" E
	7	23° 39' 35.843" N	88° 5' 6.202" E
	8	23° 39' 35.843" N	88° 5' 6.202" E
	9	23° 39' 33.694" N	88° 5' 7.597" E
	10	23° 39' 33.694" N	88° 5' 7.597" E
	11	23° 39' 30.132" N	88° 5' 8.205" E
	12	23° 39' 28.608" N	88° 5' 7.655" E
	13	23° 39' 27.788" N	88° 5' 6.751" E
	14	23° 39' 23.538" N	88° 5' 6.402" E
	15	23° 39' 16.034" N	88° 5' 4.727" E
	16	23° 39' 11.303" N	88° 5' 2.267" E
	17	23° 39' 6.741" N	88° 4' 59.181" E
	18	23° 39' 4.237" N	88° 4' 57.009" E
	1	23° 39' 37.068" N	88° 5' 31.036" E
	2	23° 39' 38.412" N	88° 5' 30.939" E
	3	23° 39' 41.575" N	88° 5' 30.709" E
	4	23° 39' 43.951" N	88° 5' 28.584" E
	5	23° 39' 44.386" N	88° 5' 28.194" E
	6	23° 39' 44.480" N	88° 5' 28.110" E
	7	23° 39' 45.768" N	88° 5' 27.673" E
PBBD_KG2_AJ_22	8	23° 39' 47.166" N	88° 5' 27.339" E
	9	23° 39' 48.850" N	88° 5' 26.936" E
	10	23° 39' 49.637" N	88° 5' 26.817" E
	11	23° 39' 49.660" N	88° 5' 26.814" E
	12	23° 39' 47.815" N	88° 5' 29.913" E
	13	23° 39' 45.245" N	88° 5' 31.415" E
	14	23° 39' 39.872" N	88° 5' 32.058" E
	15	23° 39' 37.479" N	88° 5' 31.859" E
	1	23° 39' 37.068" N	88° 5' 31.036" E
	2	23° 39' 36.815" N	88° 5' 30.476" E
	3	23° 39' 36.876" N	88° 5' 30.445" E
	4	23° 39' 37.492" N	88° 5' 30.137" E
PBBD_KT1_AJ_23	5	23° 39' 37.505" N	88° 5' 30.134" E
	6	23° 39' 38.373" N	88° 5' 29.917" E
	7	23° 39' 38.412" N	88° 5' 29.908" E
	8	23° 39' 39.070" N	88° 5' 29.744" E
	9	23° 39' 39.357" N	88° 5' 29.672" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	10	23° 39' 41.319" N	88° 5' 29.183" E
	11	23° 39' 44.480" N	88° 5' 28.110" E
	12	23° 39' 44.386" N	88° 5' 28.194" E
	13	23° 39' 43.951" N	88° 5' 28.584" E
	14	23° 39' 41.575" N	88° 5' 30.709" E
	15	23° 39' 38.412" N	88° 5' 30.939" E
	1	23° 39' 32.575" N	88° 7' 7.950" E
	2	23° 39' 33.507" N	88° 7' 9.919" E
	3	23° 39' 31.696" N	88° 7' 10.557" E
	4	23° 39' 29.460" N	88° 7' 10.445" E
PBBD_KG2_AJ_25	5	23° 39' 22.345" N	88° 7' 6.929" E
	6	23° 39' 18.847" N	88° 7' 6.466" E
	7	23° 39' 27.352" N	88° 7' 5.530" E
	8	23° 39' 28.518" N	88° 7' 5.075" E
	9	23° 39' 32.305" N	88° 7' 6.315" E
DAN	MODAR RIVER	SAND BLOCK	
	1	23° 19' 8.478" N	87° 32' 37.052" E
	2	23° 19' 5.520" N	87° 32' 34.291" E
	3	23° 19' 10.393" N	87° 32' 27.760" E
PBBD_GL1_DA_01(IA)	4	23° 19' 10.955" N	87° 32' 27.378" E
	5	23° 19' 13.553" N	87° 32' 22.955" E
	6	23° 19' 16.284" N	87° 32' 19.702" E
	1	23° 19' 5.871" N	87° 32' 42.377" E
	2	23° 19' 1.164" N	87° 32' 51.989" E
	3	23° 19' 0.547" N	87° 32' 51.371" E
PBBD_GL1_DA_01(IB)	4	23° 18' 56.791" N	87° 32' 54.786" E
	5	23° 18' 58.288" N	87° 32' 46.547" E
	6	23° 19' 0.122" N	87° 32' 42.182" E
	7	23° 19' 3.235" N	87° 32' 37.718" E
	1	23° 15' 17.751" N	87° 42' 34.543" E
	2	23° 15' 11.485" N	87° 42' 30.696" E
PBBD_GL2_DA_03(IIIB)	3	23° 15' 8.655" N	87° 42' 17.161" E
	4	23° 15' 11.154" N	87° 42' 12.593" E
	5	23° 15' 15.666" N	87° 42' 11.626" E
	1	23° 15' 4.681" N	87° 43' 27.739" E
	2	23° 15' 6.114" N	87° 43' 30.428" E
	3	23° 15' 6.079" N	87° 43' 38.026" E
PBBD_GL2_DA_03(IIIC)	4	23° 14' 56.965" N	87° 43' 44.234" E
	5	23° 14' 54.310" N	87° 43' 37.739" E
	6	23° 14' 53.523" N	87° 43' 29.466" E
	7	23° 14' 48.362" N	87° 43' 29.215" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	8	23° 14' 42.817" N	87° 43' 22.705" E
	9	23° 14' 51.732" N	87° 43' 14.708" E
	10	23° 14' 53.413" N	87° 43' 8.460" E
	11	23° 14' 56.736" N	87° 43' 4.232" E
	12	23° 14' 57.788" N	87° 43' 0.000" E
	13	23° 14' 51.599" N	87° 42' 58.618" E
	14	23° 14' 56.031" N	87° 42' 37.636" E
	15	23° 14' 54.389" N	87° 42' 35.393" E
	16	23° 15' 1.002" N	87° 42' 34.310" E
	17	23° 15' 11.531" N	87° 42' 34.590" E
	18	23° 15' 20.373" N	87° 42' 42.905" E
	19	23° 15' 21.962" N	87° 42' 46.649" E
	20	23° 15' 16.510" N	87° 43' 16.030" E
	21	23° 15' 8.861" N	87° 43' 16.811" E
	1	23° 14' 42.402" N	87° 44' 0.192" E
	2	23° 14' 40.860" N	87° 43' 48.679" E
	3	23° 14' 43.138" N	87° 43' 30.701" E
	4	23° 14' 44.627" N	87° 43' 32.994" E
	5	23° 14' 47.731" N	87° 43' 31.670" E
	6	23° 14' 50.625" N	87° 43' 31.015" E
	7	23° 14' 52.033" N	87° 43' 39.067" E
PBBD_GL2_DA_03(IIID)	8	23° 14' 53.033" N	87° 43' 46.000" E
	9	23° 14' 55.291" N	87° 43' 48.917" E
	10	23° 14' 55.272" N	87° 43' 52.940" E
	11	23° 14' 52.787" N	87° 43' 54.490" E
	12	23° 14' 50.100" N	87° 43' 55.146" E
	13	23° 14' 48.412" N	87° 44' 2.958" E
	14	23° 14' 45.916" N	87° 44' 6.743" E
	15	23° 14' 42.528" N	87° 44' 7.321" E
	1	23° 15' 6.079" N	87° 43' 38.026" E
	2	23° 15' 6.114" N	87° 43' 30.428" E
	3	23° 15' 4.681" N	87° 43' 27.739" E
	4	23° 15' 8.861" N	87° 43' 16.811" E
	5	23° 15' 16.510" N	87° 43' 16.030" E
DDDD CLO DA 02/IIIE)	6	23° 15' 9.626" N	87° 43' 40.375" E
PBBD_GL2_DA_03(IIIE)	7	23° 15' 18.672" N	87° 44' 44.518" E
	8	23° 15' 17.850" N	87° 44' 54.386" E
	9	23° 15' 8.389" N	87° 45' 1.225" E
	10	23° 15' 8.670" N	87° 44' 41.953" E
	11	23° 15' 2.122" N	87° 44' 29.402" E
	12	23° 14' 51.405" N	87° 44' 25.097" E
Annexure-3			Page A 2- 22



CODE	POINT ID	LATITUDE	LONGITUDE
	13	23° 14' 48.732" N	87° 44' 22.624" E
	14	23° 14' 47.139" N	87° 44' 10.102" E
	15	23° 14' 56.947" N	87° 43' 53.541" E
	16	23° 14' 56.667" N	87° 43' 44.646" E
	1	23° 14' 32.895" N	87° 39' 24.627" E
	2	23° 14' 46.601" N	87° 39' 40.252" E
	3	23° 14' 50.164" N	87° 39' 59.440" E
	4	23° 15' 0.032" N	87° 40' 34.252" E
	5	23° 15' 13.464" N	87° 41' 45.796" E
	6	23° 15' 15.377" N	87° 42' 8.235" E
	7	23° 15' 8.287" N	87° 42' 6.106" E
	8	23° 15' 8.612" N	87° 41' 54.934" E
	9	23° 15' 6.717" N	87° 41' 47.774" E
	10	23° 14' 58.921" N	87° 41' 36.124" E
	11	23° 14' 55.400" N	87° 41' 22.995" E
	12	23° 14' 49.917" N	87° 41' 17.604" E
	13	23° 14' 43.837" N	87° 41' 5.736" E
	14	23° 14' 41.572" N	87° 41' 4.877" E
	15	23° 14' 39.833" N	87° 40' 54.015" E
	16	23° 14' 34.223" N	87° 40' 48.443" E
	17	23° 14' 31.438" N	87° 40' 48.958" E
	18	23° 14' 21.961" N	87° 40' 44.105" E
PBBD_GL2_DA_03_04	19	23° 13' 52.046" N	87° 40' 11.089" E
	20	23° 13' 44.599" N	87° 39' 46.027" E
	21	23° 13' 42.812" N	87° 39' 29.331" E
	22	23° 13' 44.327" N	87° 39' 26.510" E
	23	23° 13' 43.804" N	87° 39' 19.953" E
	24	23° 13' 45.266" N	87° 39' 12.199" E
	25	23° 13' 44.681" N	87° 39' 9.903" E
	26	23° 13' 56.515" N	87° 39' 10.444" E
	27	23° 13' 53.137" N	87° 39' 24.105" E
	28	23° 14' 4.270" N	87° 40' 0.804" E
	29	23° 14' 13.552" N	87° 40' 19.322" E
	30	23° 14' 23.706" N	87° 40' 27.119" E
	31	23° 14' 31.366" N	87° 40' 38.479" E
	32	23° 14' 42.312" N	87° 40' 53.729" E
	33	23° 14' 47.811" N	87° 40' 55.545" E
	34	23° 14' 57.247" N	87° 41' 2.759" E
	35	23° 14' 57.447" N	87° 40' 49.285" E
	36	23° 14' 51.290" N	87° 40' 40.501" E
	37	23° 14' 48.277" N	87° 40' 20.933" E
Annexure-3			Page A3- 23



CODE	POINT ID	LATITUDE	LONGITUDE
	38	23° 14' 45.179" N	87° 40' 21.104" E
	39	23° 14' 41.885" N	87° 40' 26.860" E
	40	23° 14' 42.520" N	87° 39' 58.931" E
	41	23° 14' 32.270" N	87° 39' 41.376" E
	42	23° 14' 28.142" N	87° 39' 40.797" E
	43	23° 14' 21.464" N	87° 39' 33.129" E
	44	23° 14' 15.683" N	87° 39' 16.529" E
	45	23° 14' 10.934" N	87° 39' 11.427" E
	46	23° 14' 27.154" N	87° 39' 12.943" E
	47	23° 14' 27.111" N	87° 39' 9.469" E
	1	23° 14' 26.167" N	87° 38' 47.879" E
	2	23° 14' 25.225" N	87° 38' 40.439" E
	3	23° 14' 23.829" N	87° 38' 27.740" E
	4	23° 14' 23.375" N	87° 38' 16.501" E
	5	23° 14' 24.742" N	87° 38' 5.860" E
	6	23° 14' 27.911" N	87° 37' 57.196" E
	7	23° 14' 28.758" N	87° 37' 49.501" E
	8	23° 14' 33.350" N	87° 37' 41.515" E
	9	23° 14' 36.689" N	87° 37' 38.599" E
	10	23° 14' 41.435" N	87° 37' 35.960" E
PRRD GL2 DA 03 04 I	11	23° 14' 48.050" N	87° 37' 28.221" E
1BBD_0L2_DA_05_04_1	12	23° 14' 53.728" N	87° 37' 19.522" E
	13	23° 14' 56.959" N	87° 37' 19.163" E
	14	23° 14' 59.063" N	87° 37' 17.801" E
	15	23° 15' 1.593" N	87° 37' 15.187" E
	16	23° 14' 54.276" N	87° 37' 27.306" E
	17	23° 14' 44.682" N	87° 38' 6.505" E
	18	23° 14' 38.103" N	87° 38' 10.068" E
	19	23° 14' 30.428" N	87° 38' 15.550" E
	20	23° 14' 27.139" N	87° 38' 22.403" E
	21	23° 14' 28.783" N	87° 38' 42.140" E
	22	23° 14' 26.541" N	87° 38' 49.886" E
	1	23° 14' 58.921" N	87° 41' 36.124" E
	2	23° 14' 54.614" N	87° 41' 41.175" E
	3	23° 15' 7.363" N	87° 41' 57.025" E
	4	23° 15' 4.853" N	87° 42' 34.911" E
PBBD_GL2_DA_05	5	23° 15' 1.002" N	87° 42' 34.310" E
	6	23° 14' 54.389" N	87° 42' 35.393" E
	7	23° 14' 55.631" N	87° 42' 40.057" E
	8	23° 14' 50.031" N	87° 42' 41.031" E
	9	23° 14' 48.378" N	87° 42' 55.621" E
Annexure-3			Page A3- 24



CODE	POINT ID	LATITUDE	LONGITUDE
	10	23° 14' 45.317" N	87° 43' 2.756" E
	11	23° 14' 47.479" N	87° 43' 11.706" E
	12	23° 14' 44.719" N	87° 43' 13.181" E
	13	23° 14' 40.078" N	87° 43' 12.216" E
	14	23° 14' 35.721" N	87° 42' 59.339" E
	15	23° 14' 35.104" N	87° 42' 36.313" E
	16	23° 14' 32.843" N	87° 42' 31.173" E
	17	23° 14' 40.723" N	87° 42' 9.834" E
	18	23° 14' 37.126" N	87° 41' 45.369" E
	19	23° 14' 28.902" N	87° 41' 16.279" E
	20	23° 14' 24.174" N	87° 41' 2.402" E
	21	23° 14' 17.389" N	87° 40' 49.861" E
	22	23° 14' 14.968" N	87° 40' 43.418" E
	23	23° 14' 20.037" N	87° 40' 47.956" E
	24	23° 14' 25.487" N	87° 41' 0.794" E
	25	23° 14' 29.574" N	87° 40' 51.563" E
	26	23° 14' 37.725" N	87° 40' 51.921" E
	27	23° 14' 39.833" N	87° 40' 54.015" E
	28	23° 14' 39.938" N	87° 41' 0.697" E
	29	23° 14' 41.572" N	87° 41' 4.877" E
	30	23° 14' 43.837" N	87° 41' 5.736" E
	31	23° 14' 49.917" N	87° 41' 17.604" E
	32	23° 14' 55.400" N	87° 41' 22.995" E
	1	23° 15' 6.897" N	87° 44' 48.534" E
	2	23° 15' 7.046" N	87° 44' 52.110" E
	3	23° 14' 58.136" N	87° 45' 4.883" E
	4	23° 14' 49.644" N	87° 45' 13.336" E
	5	23° 14' 47.343" N	87° 45' 29.391" E
PBBD_GL2_DA_06	6	23° 14' 40.492" N	87° 45' 44.500" E
	7	23° 14' 36.462" N	87° 44' 51.131" E
	8	23° 14' 35.515" N	87° 44' 37.814" E
	9	23° 14' 43.328" N	87° 44' 28.974" E
	10	23° 14' 42.931" N	87° 44' 21.767" E
	11	23° 15' 1.998" N	87° 44' 37.428" E
	1	23° 14' 36.462" N	87° 44' 51.131" E
	2	23° 14' 39.903" N	87° 45' 29.876" E
	3	23° 14' 40.135" N	87° 45' 32.490" E
PBBD_KH_DA_07	4	23° 14' 40.186" N	87° 45' 34.198" E
	5	23° 14' 40.200" N	87° 45' 34.647" E
	6	23° 14' 40.362" N	87° 45' 40.120" E
	7	23° 14' 40.492" N	87° 45' 44.500" E
Annexure-3			Page A3- 25



CODE	POINT ID	LATITUDE	LONGITUDE
	8	23° 14' 28.382" N	87° 45' 53.653" E
	9	23° 14' 26.487" N	87° 45' 53.709" E
	10	23° 14' 26.572" N	87° 45' 52.853" E
	11	23° 14' 31.095" N	87° 45' 32.397" E
	12	23° 14' 31.742" N	87° 45' 28.097" E
	13	23° 14' 32.843" N	87° 45' 20.781" E
	14	23° 14' 33.768" N	87° 45' 11.427" E
	15	23° 14' 34.004" N	87° 45' 8.956" E
	16	23° 14' 35.069" N	87° 45' 8.587" E
	17	23° 14' 36.187" N	87° 45' 5.167" E
	18	23° 14' 35.116" N	87° 44' 58.755" E
	19	23° 14' 35.070" N	87° 44' 58.677" E
	1	23° 14' 43.226" N	87° 46' 15.798" E
	2	23° 14' 41.420" N	87° 46' 15.749" E
	3	23° 14' 40.662" N	87° 45' 50.200" E
	4	23° 14' 40.642" N	87° 45' 49.546" E
PBBD_GL2_DA_08	5	23° 14' 46.636" N	87° 45' 45.448" E
	6	23° 14' 47.126" N	87° 45' 44.972" E
	7	23° 14' 45.230" N	87° 45' 55.239" E
	8	23° 14' 45.230" N	87° 46' 8.397" E
	1	23° 14' 38.540" N	87° 46' 36.397" E
	2	23° 14' 37.353" N	87° 46' 25.795" E
	3	23° 14' 34.095" N	87° 46' 16.481" E
	4	23° 14' 30.480" N	87° 46' 12.706" E
	5	23° 14' 27.518" N	87° 46' 10.365" E
PBBD KH DA 00	6	23° 14' 27.540" N	87° 46' 5.897" E
I DDD_KII_DA_09	7	23° 14' 31.552" N	87° 45' 56.088" E
	8	23° 14' 32.558" N	87° 45' 53.054" E
	9	23° 14' 37.022" N	87° 45' 52.186" E
	10	23° 14' 40.662" N	87° 45' 50.200" E
	11	23° 14' 41.420" N	87° 46' 15.749" E
	12	23° 14' 39.621" N	87° 46' 34.451" E
	1	23° 14' 29.606" N	87° 46' 59.930" E
	2	23° 14' 26.478" N	87° 47' 10.233" E
	3	23° 14' 22.858" N	87° 47' 12.147" E
	4	23° 14' 14.985" N	87° 47' 6.450" E
PBBD_KH_DA_09_11	5	23° 14' 16.984" N	87° 47' 0.769" E
	6	23° 14' 19.910" N	87° 47' 2.374" E
	7	23° 14' 18.531" N	87° 46' 53.979" E
	8	23° 14' 27.310" N	87° 46' 37.783" E
	9	23° 14' 28.609" N	87° 46' 15.276" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	10	23° 14' 32.734" N	87° 46' 16.194" E
	11	23° 14' 35.833" N	87° 46' 44.363" E
	1	23° 13' 55.935" N	87° 47' 38.697" E
	2	23° 13' 54.047" N	87° 47' 40.585" E
	3	23° 14' 3.238" N	87° 47' 20.124" E
DDD DD1 DA 10 12	4	23° 14' 9.940" N	87° 47' 7.397" E
FBBD_BD1_DA_10_12	5	23° 14' 16.652" N	87° 47' 12.633" E
	6	23° 14' 17.732" N	87° 47' 18.801" E
	7	23° 14' 10.569" N	87° 47' 32.928" E
	8	23° 14' 6.909" N	87° 47' 38.659" E
	1	23° 14' 38.540" N	87° 46' 36.397" E
	2	23° 14' 39.621" N	87° 46' 34.451" E
	3	23° 14' 41.420" N	87° 46' 15.749" E
PBBD_BD1_DA_10(XA)	4	23° 14' 43.226" N	87° 46' 15.798" E
	5	23° 14' 41.667" N	87° 46' 21.554" E
	6	23° 14' 42.215" N	87° 46' 28.407" E
	7	23° 14' 38.497" N	87° 46' 37.704" E
	1	23° 13' 47.259" N	87° 48' 21.382" E
	2	23° 13' 49.273" N	87° 47' 57.500" E
	3	23° 13' 50.290" N	87° 47' 54.870" E
	4	23° 13' 55.174" N	87° 47' 54.549" E
	5	23° 14' 1.733" N	87° 47' 44.720" E
	6	23° 14' 8.973" N	87° 47' 42.082" E
	7	23° 14' 21.629" N	87° 47' 30.091" E
PBBD_BD1_DA_10(XB)	8	23° 14' 23.470" N	87° 47' 25.984" E
	9	23° 13' 57.337" N	87° 48' 35.404" E
	10	23° 13' 50.682" N	87° 48' 46.561" E
	11	23° 13' 42.668" N	87° 48' 54.575" E
	12	23° 13' 47.830" N	87° 48' 25.832" E
	13	23° 14' 23.939" N	87° 47' 24.599" E
	14	23° 14' 24.170" N	87° 47' 17.593" E
	15	23° 14' 26.083" N	87° 47' 15.431" E
	1	23° 13' 54.047" N	87° 47' 40.585" E
	2	23° 13' 55.935" N	87° 47' 38.697" E
	3	23° 13' 52.935" N	87° 47' 48.026" E
	4	23° 13' 49.273" N	87° 47' 57.500" E
PBBD_BD1_DA_12(XIIA)	5	23° 13' 47.981" N	87° 48' 14.622" E
	6	23° 13' 45.993" N	87° 48' 33.229" E
	7	23° 13' 44.055" N	87° 48' 41.968" E
	8	23° 13' 40.402" N	87° 48' 49.580" E
	9	23° 13' 36.415" N	87° 48' 55.328" E
Annexure-3			Page A3- 27



CODE	POINT ID	LATITUDE	LONGITUDE
	10	23° 13' 33.804" N	87° 49' 1.084" E
	11	23° 13' 31.567" N	87° 49' 1.070" E
	12	23° 13' 31.069" N	87° 48' 57.529" E
	13	23° 13' 29.547" N	87° 48' 52.493" E
	14	23° 13' 25.922" N	87° 48' 54.705" E
	15	23° 13' 21.436" N	87° 48' 57.098" E
	16	23° 13' 14.695" N	87° 49' 2.829" E
	17	23° 13' 10.076" N	87° 49' 8.925" E
	18	23° 13' 10.197" N	87° 49' 8.673" E
	19	23° 13' 21.505" N	87° 48' 38.041" E
	20	23° 13' 31.064" N	87° 48' 19.641" E
	21	23° 13' 37.026" N	87° 48' 13.782" E
	22	23° 13' 47.100" N	87° 47' 58.260" E
	1	23° 13' 23.289" N	87° 49' 38.822" E
	2	23° 12' 58.074" N	87° 50' 6.576" E
	3	23° 12' 50.836" N	87° 50' 20.431" E
	4	23° 12' 40.664" N	87° 50' 15.977" E
	5	23° 13' 1.302" N	87° 49' 27.176" E
	6	23° 13' 10.076" N	87° 49' 8.925" E
PBBD_BD1_DA_12(XIIB)	7	23° 13' 21.436" N	87° 48' 57.098" E
	8	23° 13' 29.547" N	87° 48' 52.493" E
	9	23° 13' 31.567" N	87° 49' 1.070" E
	10	23° 13' 33.804" N	87° 49' 1.084" E
	11	23° 13' 32.755" N	87° 49' 9.372" E
	12	23° 13' 26.537" N	87° 49' 13.802" E
	13	23° 13' 26.177" N	87° 49' 23.519" E
	1	23° 12' 21.802" N	87° 51' 23.577" E
	2	23° 12' 26.937" N	87° 51' 25.878" E
PBBD BD2 DA 13(XIIIB)	3	23° 12' 26.944" N	87° 51' 30.130" E
1000_002_011_13(mild)	4	23° 12' 23.798" N	87° 51' 39.046" E
	5	23° 12' 16.538" N	87° 51' 45.049" E
	6	23° 12' 17.367" N	87° 51' 35.095" E
	1	23° 12' 33.870" N	87° 51' 30.244" E
	2	23° 12' 33.870" N	87° 51' 33.261" E
	3	23° 12' 38.693" N	87° 51' 35.672" E
	4	23° 12' 31.737" N	87° 52' 17.903" E
PBBD_BD2_DA_14	5	23° 12' 20.498" N	87° 52' 58.197" E
	6	23° 11' 58.297" N	87° 54' 3.453" E
	7	23° 11' 53.932" N	87° 54' 6.124" E
	8	23° 11' 51.869" N	87° 54' 5.887" E
	9	23° 11' 48.336" N	87° 54' 9.884" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	10	23° 11' 51.949" N	87° 53' 42.904" E
	11	23° 11' 50.555" N	87° 53' 27.900" E
	12	23° 11' 48.600" N	87° 53' 23.425" E
	13	23° 11' 54.421" N	87° 53' 16.539" E
	14	23° 12' 0.108" N	87° 52' 56.472" E
	15	23° 12' 1.574" N	87° 52' 25.905" E
	16	23° 12' 8.508" N	87° 52' 1.099" E
	17	23° 12' 14.538" N	87° 51' 55.726" E
	18	23° 12' 16.158" N	87° 51' 52.243" E
	1	23° 9' 59.122" N	87° 58' 17.997" E
	2	23° 10' 26.227" N	87° 56' 37.893" E
	3	23° 10' 17.270" N	87° 56' 44.083" E
	4	23° 10' 14.197" N	87° 57' 0.677" E
	5	23° 10' 13.509" N	87° 57' 8.436" E
	6	23° 10' 12.281" N	87° 57' 0.493" E
	7	23° 10' 13.531" N	87° 56' 42.834" E
	8	23° 10' 18.194" N	87° 56' 26.457" E
	9	23° 10' 18.050" N	87° 56' 15.534" E
	10	23° 10' 28.907" N	87° 55' 59.451" E
	11	23° 10' 50.810" N	87° 55' 40.724" E
	12	23° 11' 3.351" N	87° 55' 25.922" E
	13	23° 11' 12.500" N	87° 55' 8.961" E
	14	23° 11' 19.695" N	87° 54' 39.768" E
	15	23° 11' 42.916" N	87° 53' 24.900" E
PBBD_BD2_DA_15(XVA)	16	23° 11' 44.937" N	87° 53' 38.217" E
	17	23° 11' 44.328" N	87° 54' 12.612" E
	18	23° 11' 42.016" N	87° 54' 19.744" E
	19	23° 11' 41.345" N	87° 54' 28.675" E
	20	23° 11' 36.179" N	87° 54' 46.095" E
	21	23° 11' 26.487" N	87° 55' 2.748" E
	22	23° 11' 16.846" N	87° 55' 17.143" E
	23	23° 11' 18.623" N	87° 55' 20.802" E
	24	23° 11' 11.002" N	87° 55' 35.268" E
	25	23° 11' 10.774" N	87° 55' 38.840" E
	26	23° 11' 7.752" N	87° 55' 43.510" E
	27	23° 11' 3.483" N	87° 55' 45.472" E
	28	23° 10' 55.656" N	87° 55' 54.547" E
	29	23° 10' 54.527" N	87° 56' 1.284" E
	30	23° 10' 44.162" N	87° 56' 12.142" E
	31	23° 10' 34.414" N	87° 56' 19.444" E
PBBD_BD2_DA_15(XVB)	1	23° 9' 59.122" N	87° 58' 17.997" E
Annexure-3			Page A3- 29



CODE	POINT ID	LATITUDE	LONGITUDE
	2	23° 9' 48.731" N	87° 58' 12.384" E
	3	23° 10' 4.501" N	87° 57' 45.523" E
	4	23° 10' 10.002" N	87° 57' 27.012" E
	5	23° 10' 10.036" N	87° 57' 0.702" E
	6	23° 10' 13.531" N	87° 56' 42.834" E
	7	23° 10' 12.281" N	87° 57' 0.493" E
	8	23° 10' 14.931" N	87° 57' 17.634" E
	9	23° 10' 12.797" N	87° 57' 28.971" E
	10	23° 10' 15.005" N	87° 57' 33.639" E
	11	23° 10' 9.319" N	87° 57' 42.630" E
	12	23° 10' 10.087" N	87° 57' 50.824" E
	13	23° 10' 8.817" N	87° 58' 1.609" E
	14	23° 10' 9.392" N	87° 58' 5.893" E
	15	23° 10' 7.812" N	87° 58' 11.000" E
	1	23° 10' 27.837" N	87° 57' 21.895" E
	2	23° 10' 23.726" N	87° 57' 39.712" E
	3	23° 10' 12.583" N	87° 58' 10.980" E
	4	23° 10' 12.834" N	87° 58' 8.853" E
	5	23° 10' 11.833" N	87° 58' 3.728" E
	6	23° 10' 12.021" N	87° 58' 1.123" E
	7	23° 10' 15.613" N	87° 57' 50.727" E
	8	23° 10' 14.868" N	87° 57' 45.790" E
	9	23° 10' 18.342" N	87° 57' 40.511" E
PBBD_BD2_DA_15A	10	23° 10' 18.022" N	87° 57' 36.508" E
	11	23° 10' 18.035" N	87° 57' 20.316" E
	12	23° 10' 16.675" N	87° 57' 17.515" E
	13	23° 10' 16.280" N	87° 57' 11.743" E
	14	23° 10' 17.744" N	87° 56' 59.758" E
	15	23° 10' 19.413" N	87° 56' 54.093" E
	16	23° 10' 20.058" N	87° 56' 47.026" E
	17	23° 10' 21.368" N	87° 56' 43.685" E
	18	23° 10' 28.508" N	87° 56' 40.396" E
	19	23° 10' 30.787" N	87° 56' 35.812" E
	1	23° 9' 59.122" N	87° 58' 17.997" E
	2	23° 10' 1.818" N	87° 58' 19.454" E
	3	23° 9' 59.053" N	87° 58' 33.242" E
PRRD ME1 DA 16	4	23° 9' 55.577" N	87° 59' 0.908" E
	5	23° 9' 52.206" N	87° 59' 11.602" E
	6	23° 9' 53.608" N	87° 59' 18.535" E
	7	23° 9' 50.653" N	87° 59' 28.786" E
	8	23° 9' 20.701" N	88° 0' 3.400" E
Annexure-3			Page A3- 30



CODE	POINT ID	LATITUDE	LONGITUDE
	9	23° 9' 14.690" N	88° 0' 7.152" E
	10	23° 9' 8.326" N	88° 0' 7.780" E
	11	23° 9' 13.363" N	87° 59' 50.716" E
	12	23° 9' 18.914" N	87° 59' 46.296" E
	13	23° 9' 29.090" N	87° 59' 29.746" E
	14	23° 9' 39.883" N	87° 58' 51.302" E
	15	23° 9' 41.014" N	87° 58' 29.921" E
	16	23° 9' 48.731" N	87° 58' 12.384" E
	1	23° 9' 42.060" N	88° 0' 1.703" E
	2	23° 9' 39.113" N	88° 0' 6.211" E
	3	23° 9' 35.284" N	88° 0' 5.870" E
	4	23° 9' 29.588" N	88° 0' 8.618" E
	5	23° 9' 27.268" N	88° 0' 8.229" E
PBBD_ME1_DA_17	6	23° 9' 27.213" N	88° 0' 3.297" E
	7	23° 9' 36.835" N	87° 59' 51.924" E
	8	23° 9' 38.560" N	87° 59' 51.286" E
	9	23° 9' 43.255" N	87° 59' 43.412" E
	10	23° 9' 49.850" N	87° 59' 37.889" E
	1	23° 9' 24.051" N	88° 0' 17.268" E
	2	23° 9' 24.022" N	88° 0' 17.305" E
	3	23° 9' 17.236" N	88° 0' 26.711" E
	4	23° 9' 5.910" N	88° 0' 32.819" E
	5	23° 9' 3.276" N	88° 0' 32.975" E
	6	23° 9' 3.949" N	88° 0' 30.521" E
PBBD_ME1_DA_1/A	7	23° 9' 6.169" N	88° 0' 27.783" E
	8	23° 9' 8.998" N	88° 0' 26.688" E
	9	23° 9' 15.313" N	88° 0' 18.548" E
	10	23° 9' 19.189" N	88° 0' 15.227" E
	11	23° 9' 23.932" N	88° 0' 16.156" E
	12	23° 9' 27.104" N	88° 0' 15.110" E
	1	23° 9' 12.142" N	88° 0' 15.576" E
	2	23° 9' 12.397" N	88° 0' 18.704" E
	3	23° 9' 10.872" N	88° 0' 20.405" E
	4	23° 9' 8.873" N	88° 0' 20.911" E
	5	23° 9' 8.901" N	88° 0' 19.031" E
PBBD_JL_DA_17B	6	23° 9' 1.158" N	88° 0' 21.895" E
	7	23° 8' 58.198" N	88° 0' 21.947" E
	8	23° 8' 59.936" N	88° 0' 19.281" E
	9	23° 9' 5.252" N	88° 0' 16.790" E
	10	23° 9' 10.997" N	88° 0' 11.697" E
	11	23° 9' 12.857" N	88° 0' 11.413" E
Annexure-3			Page A3- 31



CODE	POINT ID	LATITUDE	LONGITUDE
	1	23° 7' 42.874" N	87° 59' 36.781" E
	2	23° 7' 52.304" N	87° 59' 55.642" E
	3	23° 7' 53.632" N	88° 0' 3.279" E
	4	23° 7' 57.046" N	88° 0' 7.584" E
	5	23° 7' 59.770" N	88° 0' 12.255" E
	6	23° 8' 8.514" N	88° 0' 17.158" E
	7	23° 8' 14.955" N	88° 0' 18.973" E
	8	23° 8' 23.676" N	88° 0' 27.504" E
	9	23° 8' 27.895" N	88° 0' 26.884" E
	10	23° 8' 39.740" N	88° 0' 31.253" E
PBBD_JL_DA_17C	11	23° 8' 55.229" N	88° 0' 30.717" E
	12	23° 8' 59.024" N	88° 0' 33.226" E
	13	23° 8' 52.720" N	88° 0' 37.338" E
	14	23° 8' 40.111" N	88° 0' 39.531" E
	15	23° 8' 29.694" N	88° 0' 40.079" E
	16	23° 8' 19.552" N	88° 0' 38.160" E
	17	23° 8' 6.120" N	88° 0' 29.663" E
	18	23° 7' 30.599" N	87° 59' 35.583" E
	19	23° 7' 33.266" N	87° 59' 32.339" E
	20	23° 7' 36.110" N	87° 59' 31.522" E
	21	23° 7' 40.489" N	87° 59' 32.950" E
	1	23° 7' 54.661" N	87° 59' 53.608" E
	2	23° 7' 51.845" N	87° 59' 44.508" E
	3	23° 8' 39.647" N	88° 0' 17.031" E
	4	23° 8' 52.907" N	88° 0' 17.442" E
PBBD_JL_DA_17D	5	23° 8' 43.221" N	88° 0' 20.314" E
	6	23° 8' 29.171" N	88° 0' 21.773" E
	7	23° 8' 13.726" N	88° 0' 15.406" E
	8	23° 8' 8.777" N	88° 0' 14.253" E
	9	23° 8' 1.384" N	88° 0' 7.946" E
	1	23° 6' 58.065" N	87° 59' 10.124" E
	2	23° 7' 6.311" N	87° 59' 7.646" E
	3	23° 7' 20.085" N	87° 59' 4.973" E
	4	23° 7' 24.197" N	87° 59' 8.263" E
	5	23° 7' 26.972" N	87° 59' 13.711" E
rbbb_jL_DA_10	6	23° 7' 37.350" N	87° 59' 23.852" E
	7	23° 7' 26.097" N	87° 59' 28.714" E
	8	23° 7' 19.250" N	87° 59' 22.897" E
	9	23° 7' 16.241" N	87° 59' 22.596" E
	10	23° 7' 8.787" N	87° 59' 20.362" E
PBBD_JL_DA_18A	1	23° 1' 54.102" N	87° 58' 0.707" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	2	23° 2' 1.503" N	87° 58' 15.345" E
	3	23° 2' 7.481" N	87° 58' 26.409" E
	4	23° 2' 6.839" N	87° 58' 28.848" E
	5	23° 1' 59.740" N	87° 58' 19.278" E
	6	23° 1' 54.187" N	87° 58' 4.514" E
	7	23° 1' 48.457" N	87° 57' 55.995" E
	8	23° 1' 39.830" N	87° 57' 48.646" E
	9	23° 1' 35.845" N	87° 57' 47.428" E
	10	23° 1' 33.932" N	87° 57' 45.184" E
	11	23° 1' 24.890" N	87° 57' 37.981" E
	12	23° 1' 20.797" N	87° 57' 32.003" E
	13	23° 1' 19.429" N	87° 57' 27.936" E
	14	23° 1' 24.169" N	87° 57' 28.691" E
	15	23° 1' 40.725" N	87° 57' 42.397" E
	1	23° 0' 5.427" N	87° 57' 15.611" E
	2	23° 0' 10.464" N	87° 57' 16.962" E
	3	23° 0' 14.983" N	87° 57' 20.358" E
	4	23° 0' 19.149" N	87° 57' 22.331" E
	5	23° 0' 30.059" N	87° 57' 24.031" E
	6	23° 0' 35.760" N	87° 57' 27.046" E
	7	23° 0' 37.405" N	87° 57' 30.061" E
	8	23° 0' 39.405" N	87° 57' 31.026" E
	9	23° 0' 37.010" N	87° 57' 32.158" E
	10	23° 0' 28.341" N	87° 57' 31.539" E
	11	23° 0' 24.241" N	87° 57' 26.603" E
	12	23° 0' 20.951" N	87° 57' 24.349" E
	13	23° 0' 17.856" N	87° 57' 23.993" E
PBBD_JL_DA_18B	14	23° 0' 8.024" N	87° 57' 28.050" E
	15	23° 0' 5.242" N	87° 57' 27.027" E
	16	23° 0' 5.679" N	87° 57' 23.127" E
	17	22° 59' 59.058" N	87° 57' 17.050" E
	18	22° 59' 45.554" N	87° 57' 4.696" E
	19	22° 59' 39.492" N	87° 56' 59.858" E
	20	22° 59' 32.421" N	87° 56' 50.999" E
	21	22° 59' 29.943" N	87° 56' 51.093" E
	22	22° 59' 26.858" N	87° 56' 49.064" E
	23	22° 59' 18.227" N	87° 56' 42.090" E
	24	22° 58' 57.100" N	87° 56' 35.810" E
	25	22° 58' 59.708" N	87° 56' 34.568" E
	26	22° 59' 10.244" N	87° 56' 35.882" E
	27	22° 59' 22.647" N	87° 56' 40.518" E
Annexure-3			Page A3- 33



CODE	POINT ID	LATITUDE	LONGITUDE
	28	22° 59' 31.145" N	87° 56' 48.918" E
	29	22° 59' 38.927" N	87° 56' 52.898" E
	30	23° 0' 1.372" N	87° 57' 10.051" E
	1	23° 5' 6.837" N	87° 59' 27.637" E
	2	23° 5' 2.430" N	87° 59' 34.463" E
	3	23° 4' 52.639" N	87° 59' 31.913" E
	4	23° 4' 49.938" N	87° 59' 32.004" E
PBBD_JL_DA_18C	5	23° 4' 47.333" N	87° 59' 31.790" E
	6	23° 4' 35.513" N	87° 59' 31.077" E
	7	23° 4' 39.505" N	87° 59' 16.411" E
	8	23° 4' 47.287" N	87° 59' 19.817" E
	9	23° 4' 51.399" N	87° 59' 22.667" E
	1	22° 56' 27.935" N	87° 56' 23.855" E
	2	22° 56' 28.786" N	87° 56' 17.671" E
	3	22° 56' 39.586" N	87° 56' 19.890" E
	4	22° 56' 45.159" N	87° 56' 20.225" E
	5	22° 56' 51.000" N	87° 56' 21.752" E
	6	22° 56' 55.204" N	87° 56' 20.889" E
	7	22° 57' 1.156" N	87° 56' 21.189" E
	8	22° 57' 2.780" N	87° 56' 20.010" E
	9	22° 57' 3.245" N	87° 56' 21.596" E
	10	22° 57' 10.131" N	87° 56' 22.330" E
	11	22° 57' 18.395" N	87° 56' 21.569" E
	12	22° 57' 20.647" N	87° 56' 24.855" E
	13	22° 57' 27.395" N	87° 56' 24.456" E
	14	22° 57' 40.046" N	87° 56' 26.699" E
PBBD_RN2_DA_19	15	22° 57' 53.056" N	87° 56' 26.417" E
	16	22° 58' 17.948" N	87° 56' 30.455" E
	17	22° 58' 22.896" N	87° 56' 31.753" E
	18	22° 58' 32.045" N	87° 56' 32.708" E
	19	22° 58' 36.375" N	87° 56' 33.779" E
	20	22° 58' 50.199" N	87° 56' 35.436" E
	21	22° 59' 18.086" N	87° 56' 45.071" E
	22	22° 59' 36.507" N	87° 57' 0.737" E
	23	22° 59' 36.360" N	87° 57' 2.372" E
	24	22° 59' 33.456" N	87° 57' 4.524" E
	25	22° 59' 11.607" N	87° 56' 55.066" E
	26	22° 58' 58.530" N	87° 56' 51.043" E
	27	22° 58' 15.739" N	87° 56' 36.176" E
	28	22° 57' 51.291" N	87° 56' 34.720" E
	29	22° 57' 14.930" N	87° 56' 30.105" E
Annexure-3			Page A 3- 34



CODE	POINT ID	LATITUDE	LONGITUDE
	30	22° 56' 56.525" N	87° 56' 31.243" E
	31	22° 56' 47.468" N	87° 56' 25.518" E
	32	22° 56' 39.343" N	87° 56' 25.908" E
DWAR	KESWAR RIVE	R SAND BLOCK	
	1	23° 0' 50.288" N	87° 42' 56.805" E
	2	23° 0' 45.137" N	87° 42' 57.922" E
	3	23° 0' 38.888" N	87° 43' 2.034" E
PBBD_KH_DW_01	4	23° 0' 22.638" N	87° 43' 19.795" E
	5	23° 0' 26.539" N	87° 43' 1.655" E
	6	23° 0' 34.070" N	87° 42' 51.657" E
	7	23° 0' 41.076" N	87° 42' 48.110" E
	1	23° 0' 15.630" N	87° 43' 15.294" E
	2	23° 0' 22.726" N	87° 43' 2.934" E
	3	23° 0' 25.101" N	87° 43' 0.221" E
	4	23° 0' 25.251" N	87° 43' 3.376" E
PBBD_KH_DW_02(IIA)	5	23° 0' 21.549" N	87° 43' 13.232" E
	6	23° 0' 18.616" N	87° 43' 22.247" E
	7	23° 0' 16.804" N	87° 43' 23.352" E
	8	23° 0' 11.217" N	87° 43' 24.096" E
	1	23° 0' 8.788" N	87° 43' 29.419" E
	2	23° 0' 5.542" N	87° 43' 32.913" E
	3	23° 0' 0.895" N	87° 43' 37.353" E
	4	22° 59' 59.516" N	87° 43' 38.030" E
PBBD_KH_DW_02(IIA)_1	5	22° 59' 59.227" N	87° 43' 37.771" E
	6	22° 59' 55.324" N	87° 43' 34.973" E
	7	23° 0' 0.063" N	87° 43' 31.086" E
	8	23° 0' 6.925" N	87° 43' 28.666" E
	1	22° 59' 9.559" N	87° 44' 27.233" E
	2	22° 59' 9.088" N	87° 44' 28.626" E
	3	22° 59' 3.373" N	87° 44' 32.327" E
	4	22° 58' 57.534" N	87° 44' 34.383" E
PBBD_RN2_DW_03A	5	22° 58' 53.299" N	87° 44' 33.725" E
	6	22° 58' 49.522" N	87° 44' 34.197" E
	7	22° 58' 57.169" N	87° 44' 29.835" E
	8	22° 59' 2.422" N	87° 44' 28.749" E
	9	22° 59' 7.034" N	87° 44' 24.566" E
	1	22° 58' 51.239" N	87° 44' 24.848" E
	2	22° 58' 57.399" N	87° 44' 26.051" E
PBBD_RN2_DW_04	3	22° 58' 57.067" N	87° 44' 27.882" E
	4	22° 58' 43.411" N	87° 44' 33.718" E
	5	22° 58' 39.182" N	87° 44' 32.914" E
Annexure-3			Page A3- 35



CODE	POINT ID	LATITUDE	LONGITUDE
	6	22° 58' 24.617" N	87° 44' 34.396" E
	7	22° 58' 18.527" N	87° 44' 34.251" E
	8	22° 58' 6.862" N	87° 44' 33.741" E
	9	22° 58' 5.206" N	87° 44' 34.624" E
	10	22° 58' 0.860" N	87° 44' 34.693" E
	11	22° 58' 1.538" N	87° 44' 34.298" E
	12	22° 58' 1.236" N	87° 44' 33.366" E
	13	22° 58' 10.995" N	87° 44' 29.967" E
	14	22° 58' 18.067" N	87° 44' 29.885" E
	15	22° 58' 35.254" N	87° 44' 26.384" E
	16	22° 58' 44.824" N	87° 44' 25.764" E
	1	22° 57' 53.062" N	87° 45' 37.415" E
	2	22° 57' 52.247" N	87° 45' 40.453" E
	3	22° 57' 51.005" N	87° 45' 35.164" E
	4	22° 57' 47.663" N	87° 45' 28.753" E
	5	22° 57' 47.472" N	87° 45' 25.556" E
	6	22° 57' 43.003" N	87° 45' 9.996" E
	7	22° 57' 40.413" N	87° 45' 4.630" E
	8	22° 57' 39.889" N	87° 45' 2.396" E
	9	22° 57' 40.940" N	87° 45' 0.000" E
	10	22° 57' 41.046" N	87° 44' 56.394" E
	11	22° 57' 41.961" N	87° 44' 53.116" E
	12	22° 57' 46.438" N	87° 44' 51.078" E
DDDD DN2 DW 05	13	22° 57' 51.947" N	87° 44' 40.980" E
FBBD_KIN2_DW_03	14	22° 57' 54.299" N	87° 44' 39.211" E
	15	22° 57' 59.679" N	87° 44' 36.862" E
	16	22° 58' 7.327" N	87° 44' 35.194" E
	17	22° 58' 12.147" N	87° 44' 34.849" E
	18	22° 58' 14.052" N	87° 44' 38.423" E
	19	22° 58' 8.194" N	87° 44' 40.180" E
	20	22° 58' 0.587" N	87° 44' 43.305" E
	21	22° 57' 51.048" N	87° 44' 50.295" E
	22	22° 57' 49.197" N	87° 44' 52.885" E
	23	22° 57' 47.471" N	87° 44' 58.436" E
	24	22° 57' 46.402" N	87° 45' 10.031" E
	25	22° 57' 48.211" N	87° 45' 18.501" E
	26	22° 57' 52.166" N	87° 45' 31.543" E
	1	22° 57' 40.116" N	87° 45' 53.997" E
DRRD DNO DW 06	2	22° 57' 40.197" N	87° 45' 51.920" E
	3	22° 57' 41.610" N	87° 45' 51.516" E
	4	22° 57' 45.228" N	87° 45' 47.816" E
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CODE	POINT ID	LATITUDE	LONGITUDE
	5	22° 57' 48.106" N	87° 45' 41.593" E
	6	22° 57' 48.019" N	87° 45' 33.206" E
	7	22° 57' 48.955" N	87° 45' 35.079" E
	8	22° 57' 49.270" N	87° 45' 38.291" E
	9	22° 57' 49.836" N	87° 45' 40.792" E
	10	22° 57' 49.657" N	87° 45' 43.690" E
	11	22° 57' 48.602" N	87° 45' 48.278" E
	12	22° 57' 45.203" N	87° 45' 50.845" E
	13	22° 57' 43.663" N	87° 45' 53.290" E
	14	22° 57' 41.323" N	87° 45' 53.504" E

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Annexure-3



Annexure 4 Map showing of Potential Blocks of Purba Bardhaman District





# POTENTIAL BLOCK PBBD\_MK\_AJ\_01A\_I OF AJAY RIVER






## POTENTIAL BLOCK PBBD\_MK\_AJ\_01C OF AJAY RI



<b>VER</b> 87°53'50"E					
					z
					32'50
					23°3
AJ	01C				
	I	LONG	ITUDE	C	
N	87	′° 53' 4	3.395"	E	
N	87	′° 53' 4	2.684"	E	
N	87	'° 53' 4	0.834"	E	
	87	<u>'° 53' 3</u>	9.208"	E	
IN	87	° 53' 4	1.491"	E	
	87°	53'50"E			

### POTENTIAL BLOCK PBBD\_MK\_AJ\_01D OF AJAY RIVER









### AJAY RIVER

23°33'20"N

23°33'10"N

AJ_	01E	
	LONGITUDE	
N	87° 52' 22.875" E	
N	87° 52' 29.597" E	
N	87° 52' 39.617" E	
N	87° 52' 42.344" E	1:
N	87° 52' 28.478" E	



		3'20"N
J_0	01E_I	23°3;
	LONGITUDE	
	87° 52' 19.826" E	
	87° 52' 27.946" E	
	87° 52' 32.058" E	
	87° 52' 34.320" E	
	87° 52' 36.273" E	
	87° 52' 38.651" E	



ER 87°51	'20"E 87°51'30"E	
		23°34'0"N
MK AJ	01F	23°33'50"N
JDE	LONGITUDE	
610" N	87° 50' 39.260" E	z
753" N	87° 50' 33.041" E	40
12" N	87° 50' 15.824" E	°33
13" N	87° 50' 11.000" E	23
48" N	87° 50' 15.721" E	
96" N	87° 50' 21.594" E	7
88" N	87° 50' 23.693" E	30"
678" N	87° 50' 27.908" E	33.0
420" N	87° 50' 37.500" E	23°
912" N	87° 50' 39.130" E	
229" N	87° 50' 41.528" E	
089" N	87° 50' 41.571" E	N"N
920" N	87° 50' 42.342" E	3'2(
780" N	87° 50' 42.214" E	3°3
769" N	87° 50' 43.327" E	
755" N	87° 50' 43.236" E	
698" N	87° 50' 41.927" E	z
692" N	87° 50' 40.635" E	10
863" N	87° 50' 39.055" E	°33
		23
87°5′	1'20"E 87°51'30"E	



23°34'0"N

23°33'50"N

<b>IVER</b> 87°49'	10"E	
	W	
Y RIVE	2 <b>R</b> 7	23°34'0"N
	8	
MK AJ	01G	
DE	LONGITUDE	
9" N	87° 48' 56.635" E	
′5" N	87° 48' 57.962" E	
7" N	87° 49' 0.304" E	
'4" N	87° 49' 3.074" E	
9" N	87° 49' 4.211" E	
49" N	87° 49' 9.552" E	
50" N	87° 49' 12.425" E	
65" N	87° 49' 11.189" E	
/8'' N	87° 49' 0.268'' E	0"N
20" N	8/~ 48' 30.143'' E	33'5
33" IN 92" NI	8/° 48° 50.005° E	23°
63" N	87° 48' 55.679" E	





	LONGITUDE
0" N	87° 47' 42.755" E
7" N	87° 47' 46.729" E
5" N	87° 47' 47.461" E
7" N	87° 47' 50.060" E
7" N	87° 47' 51.984" E
" N	87° 47' 53.397" E
" N	87° 47' 53.103" E
5" N	87° 47' 45.057" E
0" N	87° 47' 43.958" E
2" N	87° 47' 39.322" E





# POTENTIAL BLOCK PBBD\_MK\_AJ\_01K OF AJAY RIVER





23°35'0"N











87°43'50"E

87°44'0"E

### POTENTIAL BLOCK PBBD\_AS2\_AJ\_01Q OF AJAY RIVER

87°43'50"E



### POTENTIAL BLOCK PBBD\_AS2\_AJ\_01R OF AJAY RIVER



87°43'40"E







		23°37'10"N		
		23°37'0"N		
) AS2 AJ	01T	z		
UDE	LONGITUDE	50		
.513" N	87° 42' 55.230" E	3°36		
3.878" N	87° 42' 59.304" E	ю Й		
5.994" N	87° 43' 0.417" E			
6.417" N	87° 43' 1.069" E	7		
2.237" N	87° 43' 3.050" E	40"T		
).839" N	87° 43' 5.448" E	36'		
8.837" N	87° 43' 5.559" E	23°		
.973" N	87° 43' 8.806" E			
2.575" N	87° 43' 10.040" E			
).245" N	87° 43' 10.382" E	z		
0.011" N	87° 43' 10.999" E	130		
5.080" N	87° 43' 10.915" E	°36		
.926" N	87° 43' 5.996" E	23		
6.061" N	87° 43' 4.865" E			
.182" N	87° 42' 59.263" E	_		
9.940" N	87° 42' 54.684" E	0"N		
6.167" N	87° 42' 50.988" E	6'2		
5.879" N	87° 42' 43.636" E	3°3		
.639" N	87° 42' 23.594" E			
.056" N	87° 42' 32.718" E			
.142" N	87° 42' 37.283" E			
.800" N	87° 42' 44.009" E			
87°43	'40"E 87°43'50"E	-		



VER	87°40'40"E	
	8 10	23°37'10"N
		23°37'0"N
AS2_AJ_ df	01U	
65" N	87° 39' 54 652" E	z
26" N	87° 39' 58.053" E	,20,
57" N	87° 40' 5.498" E	3°36
27" N	87° 40' 11.923" E	, Ö
49" N	87° 40' 21.824" E	
05" N	87° 40' 25.465" E	
90" N	87° 40' 32.284" E	
17" N	87° 40' 40.581" E	
6" N	87° 40' 47.084" E	0"N
97" N	87° 40' 39.670" E	36'4
90" N	87° 40' 20.474" E	23°3
)7" N	87° 40' 3.413" E	
0'/" N	87° 39' 56.068'' E	
	87°40'40"E	



87°39'40"E

87°39'50"E

87°4

VFR	)	
0'0"E		
	6	
	7 <sup>ś</sup>	
	5	N"C
	•	-12
		23°3
M 2		
	2	
52_AJ_(	)1V	Z.
E	LONGITUDE	37'0
9" N	87° 39' 46.786" E	23°
5" N	87° 39' 46.818" E	
S" N	87° 39' 53.705" E	
9" N	87° 39' 58.485" E	
1" N	87° 40' 3.320" E	
/" N	87° 40' 3.664" E	
D" N	8/~ 40' 3.621" E	
IN III NI	8/- 39 3/.018 E	
' IN  '' NI	0/ 37 31.300 E 87º 30' 51 320'' E	
1 N	07 37 31.327 E	
40'0"E		











87°	°36'0	)"E

BD_AS2_AJ_0	1Y_II	
TITUDE	LONGITUDE	
5' 46.269" N	87° 35' 39.343" E	
5' 47.664" N	87° 35' 41.095" E	
5' 47.694" N	87° 35' 42.215" E	
5' 47.000" N	87° 35' 43.781" E	
5' 47.204" N	87° 35' 44.416" E	
5' 48.100" N	87° 35' 44.159" E	
5' 48.919" N	87° 35' 45.955" E	
5' 49.638" N	87° 35' 46.929" E	
5' 50.820" N	87° 35' 52.685" E	
5' 51.535" N	87° 35' 54.780" E	
5' 51.427" N	87° 35' 56.086" E	
5' 50.872" N	87° 35' 56.980" E	
5' 50.217" N	87° 35' 57.388" E	7
5' 49.971" N	87° 35' 58.694" E	0
5' 49.999" N	87° 36' 0.262" E	5'4
5' 50.578" N	87° 36' 1.908" E	3°3
5' 51.538" N	87° 36' 2.958" E	2
5' 51.777" N	87° 36' 3.295" E	
5' 51.441" N	87° 36' 3.664" E	
5' 49.815" N	87° 36' 0.434" E	
5' 46.679" N	87° 35' 44.809" E	



87°35'40"E

87°35'50"E

87°36'0	<b>)</b> "E	
8	1.	
9	10	
Y_III	11 • 12	
15		9
	<u>16</u>	0"N
D_AS2_AJ_UI		5'5(
11UDE 51.42(" N		3°3
51.430 <sup>°</sup> N	8/° 35' 44.809" E	N N
51.634 N	87° 35' 43.280' E	
51.018 N 51.943" N	87° 35' 39 346" E	
52 170" N	87° 35' 39 572" E	
52.781" N	87° 35' 47.671" E	
52.318" N	87° 35' 49.367" E	
55.035" N	87° 35' 58.178" E	
54.131" N	87° 35' 59.796" E	
54.330" N	87° 36' 1.776" E	
53.022" N	87° 36' 1.732" E	
52.436" N	87° 36' 2.028" E	
51.920" N	87° 36' 1.914" E	
51.511" N	87° 36' 0.941" E	
51.105" N	87° 35' 59.110" E	
51.283" N	87° 35' 57.505" E	
52.184" N	87° 35' 55.940" E	
51.854" N	87° 35' 52.354" E	
51.244" N	87° 35' 49.812" E	
52.081" N	8/- 33 4/.015 E	

. 87°36'0"E



ER		
87°34'20'	"E 87°34'30"E	
		Z
		40
		36-
		23°
		z
		30"
	017	36'
BDD_A82_AJ_		23°
6' 24 802" N	87° 33' 12 671" E	
6' 23 637" N	87° 33' 45 116" E	
6' 21 096" N	87° 33' 47 137" E	z
6' 20.097" N	87° 33' 49 463" E	20"
6' 18.879" N	87° 33' 51.370" E	36.
6' 15.625" N	87° 33' 52.849" E	23.
6' 13.581" N	87° 33' 54.573" E	
6' 11.236" N	87° 33' 55.078" E	
6' 14.639" N	87° 33' 50.555" E	7
6' 15.230" N	87° 33' 47.307" E	0
6' 18.873" N	87° 33' 41.073" E	-1.08
6' 20.601" N	87° 33' 37.758" E	3.3
6' 23.582" N	87° 33' 29.740" E	
6' 23.325" N	87° 33' 27.376" E	
<u>6' 28.000'' N</u>	87° 33' 9.584" E	
6' 28.546" N	87° 33' 11.974" E	Z"C
6' 29.148'' N	87° 33' 13.052'' E	36'(
6' 28.762" N	87° 33' 16.948'' E	3.3
6' 29.0/1" N	8/° 33' 19.08/" E	
6' 30.820 IN	87 33 21.000 E 87° 33' 23 307" E	
6' 30 144" N	87 33 23.397 E 87° 33' 27 098" E	
6' 28 645" N	87° 33' 30 498" E	
6' 28 193" N	87° 33' 33 603" E	0,5(
6' 27.302" N	87° 33' 36.527" E	}°3,
6' 24.921" N	87° 33' 40.222" E	23
87°34'20	"E 87°34'30"E	





F	87°58'10	"F 87°58'3	80"F
_			1
			Z
	PBBD_MK_AJ	_03	0
NO	LATITUDE	LONGITUDE	-ř
	23° 37' 46.698" N	87° 57' 39.394" E	ŝ
	23° 37' 46.086" N	87° 57' 37.537" E	33
	23° 37' 44.308" N	87° 57' 38.976" E	
	23° 37' 43.022" N	87° 57' 34.729" E 💋	
	23° 37' 41.357" N	87° 57' 32.798" E	L
	23° 37' 35.332" N	87° 57' 25.815" E	
	23° 37' 11.689" N	87° 57' 9.564" E	
	23° 37' 1.667" N	87° 57' 7.611" E	z
	23° 36' 44.192" N	87° 57' 3.602" E	0"
	23° 36' 38.384" N	87° 57' 3.911" E	L M
	23° 36' 33.296" N	87° 57' 3.294" E	37
	23° 36' 21.755" N	87° 56' 59.607" E	ကိ
	23° 36' 18.256" N	87° 56' 57.410" E	
	23° 36' 17.522" N	87° 56' 55.971" E	
	23° 36' 17.937" N	87° 56' 55.615" E	
	23° 36' 18.515" N	87° 56' 55.709" E	F
	23° 36' 18.883" N	87° 56' 56.205" E	
	23° 36' 20.775" N	87° 56' 57.383" E	
	23° 36' 25.680" N	87° 56' 58.853" E	
	23° 36' 29.934" N	87° 56' 58.794" E	9
	23° 36' 31.144" N	87° 56' 56.741" E	
	23° 36' 35.443" N	87° 56' 56.100" E	
	23° 36' 37.418" N	87° 56' 57.190" E	N
	23° 36' 38.980" N	87° 56' 57.103" E	Z
	23° 36' 55.147" N	87° 57' 5.302" E	þ
	23° 36' 58.169" N	87° 57' 6.097" E	<b>⊢</b> Ω
	23° 37' 2.704" N	87° 57' 6.364" E	ŝ
	23° 37' 17.849" N	87° 57' 10.130" E	
	23° 37' 22.222" N	87° 57' 7.240" E	۲.
	23° 37' 25.162" N	87° 57' 10.008" E	2
	23° 37' 29.564" N	87° 57' 13.689" E	- 00
	23° 37' 30.620" N	87° 57' 14.254" E	ŝ
	23° 37' 32 496" N	87° 57' 17 097" E	53
	23° 37' 33.787" N	87° 57' 17.312" E	
	23° 37' 36 731" N	87° 57' 20 041" E	
	23° 37' 38.954" N	87° 57' 24.811" E	┝
	23° 37' 42.634" N	87° 57' 29.069" E	
	23° 37' 43.331" N	87° 57' 27.033" E	
	23° 37' 40.606" N	87° 57' 25.505" E	Z
	23° 37' 40 016" N	87° 57' 22 991" E	l õ
	23° 37' 36.798" N	87° 57' 18.008" E	-60
	23° 37' 38.079" N	87° 57' 15.687" E	လိ
	23° 37' 41.497" N	87° 57' 14.935" E	23
	23° 37' 44.939" N	87° 57' 16.496" E	
	23° 37' 44.531" N	87° 57' 19.830" E	
	23° 37' 50.824" N	87° 57' 32.904" E	┝
	23° 37' 50.844" N	87° 57' 39.768" E	
	23° 37' 49.445" N	87° 57' 40.102'' E	
			J
"Е	87°58'10	D"E 87°58'	30"E



VER	87°57'10"E	
		23°36'30"N
D_MK_AJ_ TUDE 7.712" N 0.292" N 0.292" N 0.713" N 5.305" N 3.803" N 2.429" N 0.288" N 0.288" N 0.781" N 0.282" N	03A LONGITUDE 87° 56' 57.523" E 87° 56' 55.453" E 87° 56' 54.894" E 87° 56' 54.465" E 87° 56' 54.465" E 87° 56' 55.283" E 87° 56' 56.033" E 87° 56' 56.369" E 87° 56' 56.776" E 87° 56' 57.310" E 87° 57'10"E	23°36'20"N



41 35 ER 34 PBBD_MK_AJ_03B ATITUDE LONGITUDE 37' 38.516" N 87° 57' 11.897" E 37' 36.701" N 87° 57' 11.481" E 37' 36.701" N 87° 57' 11.481" E 37' 35.628" N 87° 57' 11.428" E 37' 35.628" N 87° 57' 11.428" E 37' 32.617" N 87° 57' 10.833" E 37' 32.282" N 87° 57' 10.833" E 37' 30.636" N 87° 57' 10.628" E 37' 30.102" N 87° 57' 10.223" E 37' 29.647" N 87° 57' 10.354" E	23°37'40"N
41   35     ER   35     BBD_MK_AJ_03B   1     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 35.628" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.223" E     37' 29.647" N   87° 57' 10.354" E	23°37'4
41   35     ER   34     PBBD_MK_AJ_03B   1     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	23°3
41   35     ER	23
41   35     ER	
41   35     ER	
41   35     5R   35     34   35     PBBD_MK_AJ_03B   41     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 35.628" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 30.636" N   87° 57' 10.223" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
41   35     SR   34     34   35     PBBD_MK_AJ_03B   ATITUDE     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.617" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
41   35     5R   34     34   35     PBBD_MK_AJ_03B   1000000000000000000000000000000000000	
Jak     Jak     PBBD_MK_AJ_03B     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 38.516" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 35.628" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
34 <b>BBD_MK_AJ_03B</b> ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
34     PBBD_MK_AJ_03B     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
34     PBBD_MK_AJ_03B     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
34     PBBD_MK_AJ_03B     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
34     PBBD_MK_AJ_03B     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
34     PBBD_MK_AJ_03B     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
PBBD_MK_AJ_03B     ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 30.636" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
ATITUDE   LONGITUDE     37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 10.764" E     37' 30.636" N   87° 57' 10.223" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
37' 38.516" N   87° 57' 11.897" E     37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 11.628" E     37' 30.636" N   87° 57' 10.764" E     37' 30.102" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	
37' 36.701" N   87° 57' 11.481" E     37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 11.628" E     37' 30.636" N   87° 57' 10.764" E     37' 30.102" N   87° 57' 10.223" E     37' 29.647" N   87° 57' 10.354" E	
37' 35.628" N   87° 57' 11.428" E     37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 11.628" E     37' 30.636" N   87° 57' 10.764" E     37' 30.102" N   87° 57' 10.223" E     37' 29.647" N   87° 57' 10.354" E	
37' 33.856" N   87° 57' 10.833" E     37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 11.628" E     37' 30.636" N   87° 57' 10.764" E     37' 30.102" N   87° 57' 10.223" E     37' 29.647" N   87° 57' 10.354" E	
37' 32.617" N   87° 57' 10.824" E     37' 32.282" N   87° 57' 11.628" E     37' 30.636" N   87° 57' 10.764" E     37' 30.102" N   87° 57' 10.223" E     37' 29.647" N   87° 57' 10.354" E	
37' 32.282" N   87° 57' 11.628" E     37' 30.636" N   87° 57' 10.764" E     37' 30.102" N   87° 57' 10.223" E     37' 29.647" N   87° 57' 10.354" E	
37' 30.636" N   87° 57' 10.764" E     37' 30.102" N   87° 57' 10.223" E     37' 29.647" N   87° 57' 10.354" E     37' 29.647" N   87° 57' 10.354" E	Z"C
37' 30.102" N 87° 57' 10.223" E   37' 29.647" N 87° 57' 10.354" E	130
37' 29.647" N     87° 57' 10.354" E       7' 29.647" N     87° 57' 10.354" E	°37
	23
5/ 28.621" N 8/° 5/' 9.316" E	
37' 27.716" N 87° 57' 8.771" E	
37' 26.976" N 87° 57' 8.183" E	
37' 26.942" N 87° 57' 7.018" E	
37' 27.671" N 87° 57' 6.518" E	
37' 27.991" N 87° 57' 6.576" E	
37' 28.854" N 87° 57' 6.732" E	
37' 29.563" N 87° 57' 6.966" E	
37' 31.428" N 87° 57' 7.580" E	
37' 36.528" N 87° 57' 9.870" E	
37' 38.648" N 87° 57' 11.040" E	
37' 39.356" N 87° 57' 11.431" E	
37' 38.516" N 87° 57' 11.897" E	
87°57'20"E	



VER		
▼ <b>1</b> 21 <b>▼</b> 87°58'30"E	87°58'40"E	
		23°38'0"N
	9	23°37'50"N
PBBD_KG1_AJ	_04	
TITUDE	LONGITUDE	
7' 56.070" N	87° 57' 30.211" E	10t
7' 56.444" N	87° 57' 37.654" E	-72
7' 54.607" N	87° 57' 42.589" E	3°0
7' 50.463" N	87° 57' 51.896" E	
7' 49.398" N	87° 57' 57.164" E	
7' 48.900" N	87° 58' 10.181" E	
7' 50.588" N	87° 58' 26.959" E	
7' 56.394" N	87° 58' 35.521" E	z
7' 51.240" N	87° 58' 34.969" E	30'
7' 50.396" N	87° 58' 33.046" E	37-
7' 49.471" N	87° 58' 25.433" E	23°
7' 47.909" N	87° 58' 21.374" E	
7' 47.883" N	87° 58' 18.909" E	
7' 46.760" N	87° 58' 13.612" E	
7' 47.056" N	87° 58' 5.771" E	
7' 47.120" N	87° 58' 2.231" E	
7' 48.557" N	87° 57' 56.953" E	7'2(
7' 48.507" N	87° 57' 51.663" E	°3.
7' 48.938" N	87° 57' 48.882" E	53
7' 51.040" N	87° 57' 44.525" E	
7' 52.029" N	87° 57' 39.486" E	
7' 53.250" N	87° 57' 35.712" E	
87°58'30"E	87°58'40"E	J



8'	3	0"	Е

14 16		23°
	05.06	°37'40"N
PBBD_KG1_AJ		13°
22° 27' 50 225" N	27° 57' 44 400" E	
25° 37 30.325 N	8/ 3/ 44.400 E	
23 37 47.303 N	87° 57' 40 483" E	
23° 37' 40.323' N	87° 57' 53 306" E	
23° 37' 47.209' N	87° 57' 54 731" F	
23° 37' 47 767" N	87° 57' 57 753" E	
23° 37' 46 418" N	87° 58' 2 270" E	130
23° 37' 46 168" N	87° 58' 6 686" E	37
23° 37' 45.016" N	87° 58' 12.763" E	ů ů
23° 37' 43.517" N	87° 58' 17.174" E	
23° 37' 43.997" N	87° 58' 19.508" E	
23° 37' 45.433" N	87° 58' 21.042" E	
23° 37' 45.425" N	87° 58' 28.930" E	
23° 37' 46.811" N	87° 58' 31.809" E	
23° 37' 49.145" N	87° 58' 34.745" E	
23° 37' 46.268" N	87° 58' 34.437" E	20
23° 37' 42.402" N	87° 58' 27.447" E	31
23° 37' 41.207" N	87° 58' 20.529" E	ů,
23° 37' 43.101" N	87° 58' 9.226" E	
23° 37' 43.440" N	87° 57' 59.032" E	
23° 37' 44.995" N	87° 57' 48.931" E	
23° 37' 45.088" N	87° 57' 43.059" E	
23° 37' 44.308" N	87° 57' 38.976" E	
23° 37' 46.086" N	87° 57' 37.537" E	Z
23° 37' 46.698'' N	87° 57' 39.394" E	9
23° 37' 49.445" N	8/~ 5/ 40.102" E	1
23° 37' 30.844" N	8/° 5/° 39./68" E	3°

37'50"N




RIVER 87°59'20	)"E	87°59'30"E
		23°38'30"N
		23°38'20"N
D_KGI_AJ_C ITUDE 17.911" N 27.220" N 28.916" N 30.038" N 29.571" N 28.175" N 25.883" N 23.904" N 26.842" N 26.999" N 24.574" N 22.385" N 19.978" N 16.572" N 16.179" N	J9_10           LONGITUDI           87° 58' 52.841"           87° 59' 3.556"           87° 59' 3.556"           87° 59' 3.556"           87° 59' 7.444"           87° 59' 7.444"           87° 59' 13.708"           87° 59' 19.401"           87° 59' 22.426"           87° 59' 24.416"           87° 59' 25.405"           87° 59' 19.532"           87° 59' 16.545"           87° 59' 8.160"           87° 59' 5.810"           87° 59' 0.331"           87° 58' 57.116"	E       E
14.134" N 9.963" N 6.042" N 5.458" N 14.437" N 87°59'2	87° 58' 54.038" 87° 58' 49.735" 87° 58' 46.859" 87° 58' 44.425" 87° 58' 51.274"	E E E E 87°59'30"E





<b>VER</b> 38°0'10"E	88°0'20"E	
SD_KC		23°38'10"N
		23°38'0"N
KG1_AJ	_11	
DE	LONGITUDE	
-2" N	87° 59' 34.778" E	
7" N	87° 59' 39.367" E	N"C
5" N	87° 59' 50.683" E	12,20
8" N	87° 59' 56.161" E	23°3
12" N	88° 0' 18.960" E	
38" N	<u>88° 0' 15.404" E</u>	
'8" N	<u>88° 0' 7.591" E</u>	
21" N	88° 0' 1.220" E	
9" N	87° 59' 55.776" E	
48" N	87° 59' 42.963" E	0"N
41" N	87° 59' 39.644" E	37'4
49" N	87° 59' 36.479" E	23°3
88°0'10"E	88°0'20"E	



JI_10_	
E	LONGITUDE
" N	88° 0' 22.361" E
5" N	88° 0' 23.239" E
5" N	88° 0' 22.732" E
" N	88° 0' 25.690" E
" N	88° 0' 26.401" E
" N	88° 0' 23.016" E
" N	88° 0' 20.354" E
2" N	88° 0' 21.090" E
	88°0'30"E

### **KETUGRAM 1**

## **AJAY RIVER**

88°0'30"E

23°38'20"N



23°37'50"N



23°38'10"N

Y E N		
2		
9	7 8 1	
_KG2_AJ		Z"(
DE	LONGITUDE	8'10
37" N	88° 0' 59.627" E	3°3.
60" N	88° 1' 1.692" E	0
11" N	88° 1' 3.890" E	
32" N	88° 1' 6.678" E	
23" N	88° 1' 7.035" E	
28" N	88° 1' 5.680" E	
45" N	88° 1' 3.385" E	
04" N	88° 1' 3.248" E	
59" N	88° 1' 1.520" E	
95" N	88° 0' 59.763" E	
92" N	88° 0' 48.863" E	
07" N	88° 0' 40.995" E	
22" N	88° 0' 47.072" E	
02" N		
	88° 0' 51.517" E	



KG2_AJ_	_14A	
DE	LONGITUDE	7
)2" N	88° 1' 6.159" E	10"
38" N	88° 1' 7.099" E	38 - 38 -
38" N	88° 1' 9.337" E	23°
30" N	88° 1' 21.190" E	
26" N	88° 1' 22.970" E	
17" N	88° 1' 24.198" E	
58" N	88° 1' 24.844" E	
)8" N	88° 1' 20.537" E	
6" N	88° 1' 14.154" E	

23°38'20"N









<b>ER</b> 2'0"E		
	W W E	
		23°38'20"N
BD_KG2_AJ	_15	
TUDE	LONGITUDE	
23.146" N	88° 1' 29.428" E	
24.634" N	88° 1' 30.844" E	
26.389" N	88° 1' 35.047" E	
27.140 IN 27.014" N	88° 1 38.041 E	
27.014 N 23.495" N	88° 1' 47 993" E	
2 <u>3.435 N</u> 21 444" N	88° 1' 50 128" E	-
7 962" N	88° 1' 52 193" E	0"0
6.146" N	88° 1' 52.790" E	38'1
7.862" N	88° 1' 52.350" E	23°
4.607" N	88° 1' 50.428" E	
20.870" N	88° 1' 46.322" E	
22.672" N	88° 1' 44.431" E	
24.014" N	88° 1' 41.974" E	
24.392" N	88° 1' 33.024" E 🗾	

88°2'0"E



### POTENTIAL BLOCK PBBD\_MK\_AJ\_17 OF AJAY RIVER



# POTENTIAL BLOCK PBBD\_KT1\_AJ\_18 OF AJAY RIVER



23°38'0"N



•	
88°3'0"E	

BD_KG2_AJ	_19	
TUDE	LONGITUDE	
5.517" N	88° 2' 26.331" E	Z
8.831" N	88° 2' 28.039" E	20
1.002" N	88° 2' 32.468" E	°38-
4.366" N	88° 2' 35.632" E	23,
6.062" N	88° 2' 41.428" E	
6.137" N	88° 2' 44.525" E	
2.913" N	88° 3' 3.089" E	
1.460" N	88° 3' 4.629" E	
0.962" N	88° 3' 4.489" E	
1.488" N	88° 2' 59.251" E	
0.759" N	88° 2' 50.019" E	
9.842" N	88° 2' 44.971" E	0"2
7.493" N	88° 2' 39.470" E	- 20
6.284" N	88° 2' 37.932" E	3°3
5.119" N	88° 2' 36.450" E	
6.801" N	88° 2' 30.667" E	
5.284" N	88° 2' 26.784" E	
00		



WA 1		23°38'40"N
KT1 AI	20.4	
_ <u></u> [] <b>D</b> E	LONGITUDE	
972" N	88° 3' 11.568" E	
265" N	88° 3' 16.461" E	
420" N	88° 3' 19.906" E	0"\
533" N	88° 3' 23.511" E	-83
894" N	88° 3' 23.746" E	3°3
589" N	88° 3' 22.795" E	
104" N	88° 3' 25.476" E	
144" N	88° 3' 27.426" E	
829" N	88° 3' 26.519" E	
336" N	88° 3' 27.403" E	
002" N	88° 3' 26.578" E	
359" N	88° 3' 27.457" E	
648" N	88° 3' 25.751" E	

88° 3' 22.472" E

88° 3' 12.874" E

88° 3' 11.036" E

88° 3' 10.832" E

88°3'40"E

88°3'40"E



BBD_KT1_AJ	_21	Z
<b>FITUDE</b>	LONGITUDE	9'20
)' 2.016" N	88° 4' 55.736" E	°36
)' 1.241" N	88° 4' 54.812" E	23
9' 5.804" N	88° 4' 54.270" E	
' 12.667" N	88° 5' 0.240" E	
' 15.960" N	88° 5' 1.792" E	
' 26.118" N	88° 5' 5.701" E	
' 35.843" N	88° 5' 6.202" E	
' 35.843" N	88° 5' 6.202" E	z
' 33.694" N	88° 5' 7.597" E	10
' 33.694" N	88° 5' 7.597" E	30-
' 30.132" N	88° 5' 8.205" E	33
' 28.608" N	88° 5' 7.655" E	
' 27.788" N	88° 5' 6.751" E	
' 23.538" N	88° 5' 6.402" E	
' 16.034" N	88° 5' 4.727" E	
' 11.303" N	88° 5' 2.267" E	
9' 6.741" N	88° 4' 59.181" E	
9' 4.237" N	88° 4' 57.009" E	
88°5'20	)"E 88°5'3	∎ 60"E



23°39'30"N

### POTENTIAL BLOCK PBBD\_KG2\_AJ\_22 OF AJAY RIVER



### POTENTIAL BLOCK PBBD\_KT1\_AJ\_23 OF AJAY RIVER

88°5'30"E













AR RIV	ER	
87°43'30"E	87°43'40"E	
	GALSI 2	23°15'20"N
	3 -•	23°15'10"N
6	4	23°15'0"N
• 7 D.	AMODAR RIVER	23°14'50"N
		Z
		40
LATITUDE		4
23° 14' 56.736" N	87° 43' 4.232" E	5 N
23° 14' 57.788" N	87° 43' 0.000" E	
23° 14' 51.599" N	87° 42' 58.618'' E	
23° 14' 50.031' N	87° 42' 37.030' E	
23° 15' 1 002" N	87° 42' 34 310" E	Z
23° 15' 11.531" N	87° 42' 34.590" E	30
23° 15' 20.373" N	87° 42' 42.905" E	7
23° 15' 21.962" N	87° 42' 46.649" E	23
23° 15' 16.510" N	87° 43' 16.030" E	-
23° 15' 8.861" N	87° 43' 16.811" E	
87°43'30"E	87°43'40"E	

### POTENTIAL BLOCK PBBD\_GL2\_DA\_03(IIID) OF DAMODAR RIVER





AR RI	VER	
57°44'40"E	87°44'50"E 87°45'0	"E
		0_N
		15'2
////···	<u></u>	23°1
		z
••		10"
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	The second se	53
		Z
		15'0
		23°1
DA	MODAR	7
DA	<b>MODAR</b>	50"N
	MODAR RIVER	14'50"N
DA ] BBD_GL2_DA	AMODAR RIVER (103(IIIE)	23°14'50"N
DA ] BBD_GL2_DA LATITUDE ° 15' 6 079" N	AMODAR RIVER (03(IIIE) LONGITUDE 87° 43' 38 026" E	23°14'50"N
DA ] BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6 114" N	AMODAR RIVER _03(IIIE) 	V 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N	AMODAR RIVER _03(IIIE) 	0"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8 861" N	AMODAR RIVER 	4'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 16 510" N	AMODAR RIVER 	3°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 16.510" N ° 15' 0.626" N	AMODAR RIVER 	23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 16.510" N ° 15' 9.626" N ° 15' 18 672" N	AMODAR RIVER 	23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 16.510" N ° 15' 9.626" N ° 15' 18.672" N	AMODAR RIVER 	N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 8.861" N ° 15' 16.510" N ° 15' 9.626" N ° 15' 18.672" N ° 15' 17.850" N ° 15' 9.200" N	AMODAR RIVER 	30"N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 16.510" N ° 15' 9.626" N ° 15' 18.672" N ° 15' 17.850" N ° 15' 8.389" N ° 15' 8.389" N	AMODAR RIVER 	14'30"N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 16.510" N ° 15' 9.626" N ° 15' 17.850" N ° 15' 8.389" N ° 15' 8.670" N ° 15' 8.670" N	AMODAR RIVER -03(IIIE) LONGITUDE 87° 43' 38.026" E 87° 43' 30.428" E 87° 43' 27.739" E 87° 43' 16.811" E 87° 43' 16.811" E 87° 43' 16.030" E 87° 43' 40.375" E 87° 44' 44.518" E 87° 44' 54.386" E 87° 44' 54.386" E 87° 44' 41.953" E 87° 44' 41.953" E	3°14'30"N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 8.861" N ° 15' 9.626" N ° 15' 9.626" N ° 15' 17.850" N ° 15' 8.389" N ° 15' 8.389" N ° 15' 8.670" N ° 15' 2.122" N	AMODAR RIVER 	23°14'30"N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 8.861" N ° 15' 9.626" N ° 15' 18.672" N ° 15' 17.850" N ° 15' 8.389" N ° 15' 8.670" N ° 15' 2.122" N ° 14' 51.405" N	AMODAR RIVER $03(IIIE)$ LONGITUDE $87^{\circ} 43' 38.026" E$ $87^{\circ} 43' 30.428" E$ $87^{\circ} 43' 27.739" E$ $87^{\circ} 43' 16.811" E$ $87^{\circ} 43' 16.811" E$ $87^{\circ} 43' 16.030" E$ $87^{\circ} 43' 40.375" E$ $87^{\circ} 44' 44.518" E$ $87^{\circ} 44' 54.386" E$ $87^{\circ} 44' 54.386" E$ $87^{\circ} 44' 41.953" E$ $87^{\circ} 44' 29.402" E$ $87^{\circ} 44' 25.097" E$	23°14'30"N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 8.861" N ° 15' 9.626" N ° 15' 18.672" N ° 15' 8.389" N ° 15' 8.389" N ° 15' 8.670" N ° 15' 2.122" N ° 14' 51.405" N ° 14' 48.732" N	AMODAR RIVER $a_03(IIIE)$ LONGITUDE $87^{\circ} 43' 38.026'' E$ $87^{\circ} 43' 30.428'' E$ $87^{\circ} 43' 30.428'' E$ $87^{\circ} 43' 27.739'' E$ $87^{\circ} 43' 16.811'' E$ $87^{\circ} 43' 16.030'' E$ $87^{\circ} 43' 40.375'' E$ $87^{\circ} 44' 44.518'' E$ $87^{\circ} 44' 54.386'' E$ $87^{\circ} 44' 54.386'' E$ $87^{\circ} 44' 54.386'' E$ $87^{\circ} 44' 41.953'' E$ $87^{\circ} 44' 29.402'' E$ $87^{\circ} 44' 25.097'' E$ $87^{\circ} 44' 22.624'' E$	23°14'30"N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.079" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 8.861" N ° 15' 9.626" N ° 15' 9.626" N ° 15' 18.672" N ° 15' 8.389" N ° 15' 8.389" N ° 15' 8.389" N ° 15' 8.389" N ° 15' 8.405" N ° 14' 47.139" N	AMODAR RIVER $03(IIIE)$ LONGITUDE $87^{\circ} 43' 38.026'' E$ $87^{\circ} 43' 30.428'' E$ $87^{\circ} 43' 27.739'' E$ $87^{\circ} 43' 16.811'' E$ $87^{\circ} 43' 16.811'' E$ $87^{\circ} 43' 16.030'' E$ $87^{\circ} 43' 40.375'' E$ $87^{\circ} 44' 44.518'' E$ $87^{\circ} 44' 54.386'' E$ $87^{\circ} 44' 54.386'' E$ $87^{\circ} 44' 54.386'' E$ $87^{\circ} 44' 29.402'' E$ $87^{\circ} 44' 25.097'' E$ $87^{\circ} 44' 10.102'' E$	23°14'30"N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 8.861" N ° 15' 9.626" N ° 15' 18.672" N ° 15' 18.672" N ° 15' 8.389" N ° 15' 8.389" N ° 15' 8.670" N ° 15' 2.122" N ° 15' 2.122" N ° 14' 51.405" N ° 14' 48.732" N ° 14' 56.947" N	AMODAR RIVER $03(IIIE)$ LONGITUDE $87^{\circ} 43' 38.026" E$ $87^{\circ} 43' 30.428" E$ $87^{\circ} 43' 27.739" E$ $87^{\circ} 43' 16.811" E$ $87^{\circ} 43' 16.811" E$ $87^{\circ} 43' 16.030" E$ $87^{\circ} 43' 40.375" E$ $87^{\circ} 44' 44.518" E$ $87^{\circ} 44' 54.386" E$ $87^{\circ} 44' 54.386" E$ $87^{\circ} 44' 29.402" E$ $87^{\circ} 44' 29.402" E$ $87^{\circ} 44' 25.097" E$ $87^{\circ} 44' 10.102" E$ $87^{\circ} 44' 53.541" E$	23°14'30"N 23°14'40"N 23°14'50"N
DA BBD_GL2_DA LATITUDE ° 15' 6.079" N ° 15' 6.114" N ° 15' 4.681" N ° 15' 8.861" N ° 15' 8.861" N ° 15' 9.626" N ° 15' 17.850" N ° 15' 8.389" N ° 15' 8.389" N ° 15' 8.670" N ° 15' 8.670" N ° 15' 2.122" N ° 15' 2.122" N ° 14' 51.405" N ° 14' 51.405" N ° 14' 56.947" N ° 14' 56.667" N	AMODAR RIVER $03(IIIE)$ LONGITUDE $87^{\circ} 43' 38.026" E$ $87^{\circ} 43' 30.428" E$ $87^{\circ} 43' 30.428" E$ $87^{\circ} 43' 27.739" E$ $87^{\circ} 43' 16.811" E$ $87^{\circ} 43' 16.030" E$ $87^{\circ} 43' 40.375" E$ $87^{\circ} 44' 44.518" E$ $87^{\circ} 44' 54.386" E$ $87^{\circ} 44' 54.386" E$ $87^{\circ} 44' 54.386" E$ $87^{\circ} 44' 29.402" E$ $87^{\circ} 44' 22.624" E$ $87^{\circ} 44' 10.102" E$ $87^{\circ} 43' 53.541" E$ $87^{\circ} 43' 44.646" E$	23°14'30"N 23°14'40"N 23°14'50"N

## POTENTIAL BLOCK PBBD\_GL2\_DA\_03\_04 OF DAMODAI



30"E 87°41'50"E 8	37°42'10"E
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	14'0"N 23°14'2
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LATITUDE         LON           23° 13' 45.266" N         87° 35	N"'0'15'16' C'1
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 44.681" N         87° 3	NGITUDE 9' 9.903" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39	NIO.444" E 0' 10.444" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 55.15" N         87° 39           23° 13' 55.71" N         87° 39           23° 13' 53.137" N         87° 39	NGITUDE 9' 9.903" E 9' 9.903" E 9' 24.105" E 0' 0.804" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 44.681" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 53.137" N         87° 39           23° 14' 4.270" N         87° 40	NGITUDE 0' 12.199" E 9' 9.903" E 0' 10.444" E 0' 24.105" E 0' 0.804" E 0' 19.322" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 14' 5.20° N         87° 44           23° 14' 13.552" N         87° 44           23° 14' 23.706" N         87° 44	NIO 7 12.199" E 9' 9.903" E 9' 12.199" E 9' 10.444" E 9' 24.105" E 0' 0.804" E 0' 19.322" E 0' 27.119" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 44.681" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 55.21" N         87° 44           23° 14' 13.552" N         87° 44           23° 14' 31.366" N         87° 44	NGITUDE 9' 9.903" E 9' 9.903" E 9' 24.105" E 0' 0.804" E 0' 19.322" E 0' 19.322" E 0' 19.322" E 0' 19.322" E 0' 19.322" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 44.681" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 53.137" N         87° 40           23° 14' 13.552" N         87° 40           23° 14' 23.706" N         87° 40           23° 14' 31.366" N         87° 40           23° 14' 42.312" N         87° 40	NGITUDE 0' 12.199" E 9' 9.903" E 0' 12.199" E 9' 9.903" E 0' 12.199" E 0' 13.322" E 0' 13.3729" E 0' 13.3729" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 14' 4.270" N         87° 40           23° 14' 13.552" N         87° 40           23° 14' 31.366" N         87° 40           23° 14' 42.312" N         87° 40	NIIO44       E         0' 12.199" E       9' 9.903" E         0' 12.199" E       9' 9.903" E         0' 10.444" E       0' 24.105" E         0' 0.804" E       0' 27.119" E         0' 27.119" E       0' 38.479" E         0' 55.545" E       1' 2.750" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 44.681" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 14' 4.270" N         87° 40           23° 14' 13.552" N         87° 40           23° 14' 31.366" N         87° 40           23° 14' 42.312" N         87° 40           23° 14' 47.811" N         87° 40           23° 14' 57.247" N         87° 40           23° 14' 57.247" N         87° 40	NGITUDE 0' 12.199" E 9' 9.903" E 0' 10.444" E 0' 19.322" E 0' 0.804" E 0' 19.322" E 0' 27.119" E 0' 27.119" E 0' 38.479" E 0' 55.545" E 1' 2.759" E 1' 2.759" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 53.137" N         87° 44           23° 14' 4.270" N         87° 44           23° 14' 31.366" N         87° 44           23° 14' 42.312" N         87° 44           23° 14' 42.312" N         87° 44           23° 14' 57.247" N         87° 44           23° 14'	NGITUDE 0' 12.199" E 0' 12.2759" E 0' 40.501" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 14' 4.270" N         87° 44           23° 14' 4.270" N         87° 44           23° 14' 31.366" N         87° 44           23° 14' 42.312" N         87° 44           23° 14' 57.247" N         87° 44           23° 14' 51.290" N         87° 44	NGITUDE 9' 9.903" E 9' 9.903" E 9' 9.903" E 9' 24.105" E 0' 0.804" E 9' 24.105" E 0' 0.804" E 1' 2.759" E 0' 49.285" E 1' 2.759" E 0' 49.285" E 1' 2.759" E 0' 40.501" E 0' 20.933" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 44.681" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 53.137" N         87° 40           23° 14' 13.552" N         87° 40           23° 14' 23.706" N         87° 40           23° 14' 31.366" N         87° 40           23° 14' 57.247" N         87° 40           23° 14' 51.290" N         87° 40           23° 14' 45.179" N         87° 40           23° 14' 45.179" N         87° 40	VGITUDE         0' 12.199" E         9' 9.903" E         0' 10.444" E         0' 10.444" E         0' 24.105" E         0' 0.804" E         0' 19.322" E         0' 38.479" E         0' 38.479" E         0' 55.545" E         1' 2.759" E         0' 49.285" E         0' 40.501" E         0' 21.104" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 53.137" N         87° 44           23° 14' 4.270" N         87° 44           23° 14' 31.366" N         87° 44           23° 14' 42.312" N         87° 44           23° 14' 57.247" N         87° 44           23° 14' 51.290" N         87° 44           23° 14' 51.290" N         87° 44           23° 14' 45.179" N         87° 44           23° 14' 45.270" N         87° 44           23° 14' 45.270" N         87° 44           23° 14' 45.270" N         87° 44           23° 14' 45.290" N         87° 44           23° 14' 45.270" N         87° 44           23° 14' 45.270" N         87° 44           23° 14'	Null Content of the second sec
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 14' 4.270" N         87° 44           23° 14' 4.270" N         87° 44           23° 14' 13.552" N         87° 44           23° 14' 31.366" N         87° 44           23° 14' 42.312" N         87° 44           23° 14' 57.247" N         87° 44           23° 14' 51.290" N         87° 44           23° 14' 45.179" N         87° 44           23° 14' 4	NGITUDE 9' 9.903" E 9' 9.903" E 9' 9.903" E 9' 24.105" E 0' 10.444" E 9' 24.105" E 0' 10.322" E 1' 2.759" E 0' 40.501" E 0' 40.501" E 1' 2.759" E 0' 40.501" E 0' 26.860" E 0' 26.860" E 0' 58.931" E 0' 41.376" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 44.681" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 53.137" N         87° 40           23° 14' 13.552" N         87° 40           23° 14' 23.706" N         87° 40           23° 14' 31.366" N         87° 40           23° 14' 57.247" N         87° 40           23° 14' 57.247" N         87° 40           23° 14' 51.290" N         87° 40           23° 14' 51.290" N         87° 40           23° 14' 51.290" N         87° 40           23° 14' 48.277" N         87° 40           23° 14' 45.179" N         87° 40           23° 14' 45.20" N         87° 40           23° 14' 45.20" N         87° 40           23° 14' 45.20" N         87° 40           23° 14' 42.520" N         87° 39           23° 14' 42.520" N         87° 39           23° 14' 32.270" N         87° 39           23° 14' 28.142" N         87° 39	VGITUDE         0' 12.199" E         9' 9.903" E         0' 12.199" E         9' 9.903" E         0' 10.444" E         0' 24.105" E         0' 19.322" E         0' 19.322" E         0' 27.119" E         0' 38.479" E         0' 38.479" E         0' 49.285" E         0' 40.501" E         0' 26.860" E         0' 26.860" E         0' 58.931" E         0' 40.797" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 14' 4.270" N         87° 40           23° 14' 4.270" N         87° 40           23° 14' 42.312" N         87° 40           23° 14' 57.247" N         87° 40           23° 14' 51.290" N         87° 40           23° 14' 45.179" N         87° 40           23° 14' 45.20" N         87° 39           23° 14' 42.50" N	NIO7E         0'12.199" E         9'9.903" E         0'12.199" E         9'9.903" E         0'10.444" E         0'24.105" E         0'0.804" E         0'19.322" E         0'27.119" E         0'55.545" E         1'2.759" E         0'55.545" E         0'40.501" E         0'20.933" E         0'21.104" E         0'26.860" E         0'58.931" E         0'41.376" E         0'40.797" E         0'33.129" E
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 14' 4.270" N         87° 44           23° 14' 13.552" N         87° 44           23° 14' 23.706" N         87° 44           23° 14' 31.366" N         87° 44           23° 14' 42.312" N         87° 44           23° 14' 57.247" N         87° 44           23° 14' 45.179" N         87° 44           23° 14' 45.179" N         87° 44           23° 14'	NGITUDE         9' 9.903" E         9' 9.903" E         9' 12.199" E         9' 9.903" E         9' 10.444" E         9' 24.105" E         0' 0.804" E         0' 19.322" E         0' 19.322" E         0' 33.729" E         0' 40.501" E         0' 20.933" E         0' 40.501" E         0' 26.860" E         0' 26.860" E         0' 40.797" E         0'
LATITUDE         LON           23° 13' 45.266" N         87° 39           23° 13' 45.266" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 13' 56.515" N         87° 39           23° 14' 4.270" N         87° 40           23° 14' 13.552" N         87° 40           23° 14' 31.366" N         87° 40           23° 14' 42.312" N         87° 40           23° 14' 57.247" N         87° 40           23° 14' 45.179" N         87° 40           23° 14' 45.20" N         87° 40           23° 14' 45.20" N         87° 39           23° 14' 45.179" N         87° 40           23° 14' 45.179" N         87° 39           23° 14' 45	VGITUDE       V.0,71°, E         0' 12.199" E       9' 9.903" E         0' 12.199" E       9' 9.903" E         0' 10.444" E       0' 10.444" E         0' 24.105" E       0' 0.804" E         0' 27.119" E       0' 27.119" E         0' 38.479" E       0' 27.55.545" E         1' 2.759" E       0' 40.501" E         0' 20.933" E       0' 21.104" E         0' 26.860" E       0' 26.860" E         0' 33.129" E       0' 40.797" E         0' 33.129" E       0' 11.427" E         0' 11.427" E       0' 12.044" E





<b>R RI</b> 30"E	VER 87°42'50"E	87°43'10"E	°15'20"N
4 •5 • • •	7	S S S S S S S S S S S S S S S S S S S	23°15'0"N 23
1; 16.	5 5	10 10 12 13 13 14	23°14'40"N
POINT N 1 2 3 4 5 6 7 8	PBBD_GL2_DA           IO         LATITUDE           23° 14' 58.921" N           23° 14' 54.614" N           23° 15' 7.363" N           23° 15' 4.853" N           23° 15' 1.002" N           23° 14' 55.631" N           23° 14' 50.031" N	LONGITUDE           87° 41' 36.124" E           87° 41' 41.175" E           87° 41' 57.025" E           87° 42' 34.911" E           87° 42' 34.310" E           87° 42' 35.393" E           87° 42' 40.057" E	23°14'20"N
9 10 11 12 13 14 15 16 17 18	23° 14' 48.378" N 23° 14' 45.317" N 23° 14' 47.479" N 23° 14' 44.719" N 23° 14' 40.078" N 23° 14' 35.721" N 23° 14' 35.104" N 23° 14' 32.843" N 23° 14' 40.723" N 23° 14' 37.126" N	87° 42' 55.621" E 87° 43' 2.756" E 87° 43' 11.706" E 87° 43' 13.181" E 87° 43' 12.216" E 87° 42' 59.339" E 87° 42' 36.313" E 87° 42' 31.173" E 87° 42' 9.834" E 87° 41' 45.369" E	23°14'0"N
$ \begin{array}{r}     19 \\     20 \\     21 \\     22 \\     23 \\     24 \\     25 \\     26 \\     27 \\     28 \\     29 \\     30 \\   \end{array} $	23° 14' 28.902" N 23° 14' 24.174" N 23° 14' 17.389" N 23° 14' 14.968" N 23° 14' 20.037" N 23° 14' 25.487" N 23° 14' 29.574" N 23° 14' 37.725" N 23° 14' 39.833" N 23° 14' 39.938" N 23° 14' 41.572" N 23° 14' 43.837" N	87° 41' 16.279" E         87° 41' 2.402" E         87° 40' 49.861" E         87° 40' 43.418" E         87° 40' 47.956" E         87° 41' 0.794" E         87° 40' 51.563" E         87° 40' 51.921" E         87° 40' 54.015" E         87° 41' 0.697" E         87° 41' 5.736" E	23°13'40"N
31 32 30"E	23° 14' 49.917" N 23° 14' 55.400" N 87°42'50"E	87° 41' 17.604" E 87° 41' 22.995" E 87° 43' 10"E	



<b>R RIV</b> 245'50"E 87	<b>ER</b> ′°46'0"E	87°46'20"E
		23°15'0"N
		23°14'50"N
		23°14'40"N
MM		23°14'30"N
	06	14'20"N
_GL2_DA		
UDE 207" N	27° 11' 19	2524"E
046" N	87° 44' 5′	2 110" F
136" N	87° 45' 4	883" E
644" N	87° 45' 13	3.336" E
343" N	87° 45' 29	9.391" E
492" N	87° 45' 44	4.500" E
462" N	87° 44' 51	1.131" E 🕺
515" N	87° 44' 37	7.814" E 🛛 🛓
328" N	87° 44' 28	8.974" E
931" N	87° 44' 21	1.767" Е 📅
998" N	87° 44' 37	7.428" E
°45'50"E 8	7°46'0"E	87°46'20"E



### POTENTIAL BLOCK PBBD\_GL2\_DA\_08 OF DAMODAR RIVER



23°14'30"N





AR R	<b>SIVER</b> 87°47'10"E	
	WWESE	
		23°14'30"N
€ ∙	5	23°14'20"N
	4 • • •	
DE		z
506" N	87° 46' 59 930" F	10"
78" N	87° 47' 10 233" E	.14.
358" N	87° 47' 12.147" E	23
985" N	87° 47' 6.450" E	
984" N	87° 47' 0.769" E	
910" N	87° 47' 2.374" E 💋	
531" N	87° 46' 53.979" E	
310" N	87° 46' 37.783" E	Ž
509" N	87° 46' 15.276" E	14'0
734" N	87° 46' 16.194" E	23°.
333" N	87° 46' 44.363" E	- 4
	87°47'10"E	

### POTENTIAL BLOCK PBBD\_BD1\_DA\_10(XA) OF DAMODAR RIVER





DAR RIVI 87°48'40"E	E <b>R</b> <sup>87°48'50"E</sup>	
	N W S S	23°14'20"N
		23°14'10"N
3		23°14'0"N
	10	23°13'50"N
R		23°13'40"N
LATITUDE	LONGITUDE	
23° 14' 23.470" N	8'/° 4'7' 25.984" E	
23° 13' 50 682" N	87° 48' 46 561" E	
23° 13' 42.668" N	87° 48' 54.575" E	3'3(
23° 13' 47.830" N	87° 48' 25.832" E	1.
23° 14' 23.939" N	87° 47' 24.599" E	23
23° 14' 24.170" N	87° 47' 17.593" E	
23° 14' 26.083" N	87° 47' 15.431" E	
87°48'40"E	87°48'50"E	-




# POTENTIAL BLOCK PBBD BD1 DA 12(XIIB) OF DAMC 87°49'10"E 87°49'20"E 87°49'30"E 87°49'40"E 87°49'50"E 87°50'0"E 87°50'10"E 87°50'20"E 87°50'30"E 87°50'40"E



87°48'50"E 87°49'0"E 87°49'10"E 87°49'20"E 87°49'30"E 87°49'40"E 87°49'50"E 87°50'0"E 87°50'10"E 87°50'20"E 87°50'30"E 87°50'40'

<b>DDAR</b> E 87°50'50"E	RIVER 87°51'0"E 87°51'10"E	
		23°13'10"N 23°13'20"N 23°13'30"N
		23°13'0"N
		:3°12'50"N
BDI_DA_12		
		0"0
23.289" N	8/° 49° 38.822° E	12'4
0.074 N	8/ 30 0.3/0 E	23°
0.650 IN	87 30 20.431 E	z
1 302" N	87° 40' 27 176" E	30"
0.076" N	87° 49' 8 925" F	12-
21 436" N	87° 48' 57 098" E	23
9.547" N	87° 48' 52.493" E	Z
1.567" N	87° 49' 1.070" E	2'20
3.804" N	87° 49' 1.084" E	3°1;
2.755" N	87° 49' 9.372" E	Ň
26.537" N	87° 49' 13.802" E	0"N
.6.177" N	87° 49' 23.519" E	12'1
"E 87°50'50"E	E 87°51'0"E 87°51'10"E	23°

# POTENTIAL BLOCK PBBD\_BD2\_DA\_13(XIIIB) OF DAMODAR RIVER

23°12'30"N









		<b>ER</b>	0"⊏
			)"N 23°11'40"N r
			23°11'20
			23°11'0"N
			23°10'40"N
A	RRIVER 9 10 • 4 11	12 131415	23°10'20"N
	R RIVER 9 10 11 .4 .		)'0"N 23°10'20"N
	RRIVER 9 11		10'0"N 23°10'20"N
	RRIVER 9.11 .4 .11 	12 131415 	23°10'0"N 23°10'20"N
) )	<b>R RIVER</b> <b>9</b> 11 <b>11</b> <b>0</b> <b>11</b> <b>0</b> <b>11</b> <b>0</b> <b>11</b> <b>0</b> <b>11</b> <b>0</b> <b>11</b> <b>0</b> <b>11</b> <b>0</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b>	12 1314 3	23°10'0"N 23°10'20"N
)	<b>LATITUDE</b> 23° 11' 44.937" N 23° 11' 44.328" N	12 13 13 14 15 2 2 2 13 14 15 2 2 13 14 15 2 2 13 14 15 2 13 14 15 2 13 14 15 15 15 15 15 15 15 15 15 15	N 23°10'0"N 23°10'20"N
	<b>LATITUDE</b> 23° 11' 44.937" N 23° 11' 42.016" N	12 13 13 13 13 13 13 13 13 13 13	t0"N 23°10'0"N 23°10'20"N
	R       RIVER         9       11         .4       .1         .4          .4          .4          .4          .4          .4          .4          .4          .11          .4          .4          .4          .4          .4          .4          .4          .4          .4          .4          .4          .4          .4          .4          .4          .4          .4          .11          .11          .11          .11          .11          .11          .11	12 13 13 13 13 13 13 13 13 13 13	9'40"N 23°10'0"N 23°10'20"N
	<b>LATITUDE</b> 23° 11' 44.937" N 23° 11' 44.937" N 23° 11' 44.328" N 23° 11' 41.345" N 23° 11' 36.179" N	12 1314 13 13 13 13 13 13 13 13 13 13	23°9'40"N 23°10'0"N 23°10'20"N
	RIVER         I <thi< th=""></thi<>	12 1314 3 3 3 3 3 3 3 3 4 4 5 5 3 12 1314 5 2 2 2 2 4 5 5 4 12 5 4 12 5 5 4 12 5 5 4 12 5 5 5 3 8 2 7 5 2 5 5 3 8 2 17 18 8 7° 53' 38.217" E 8 7° 54' 12.612" E 8 7° 54' 12.612" E 8 7° 54' 28.675" E 8 7° 54' 46.095" E 8 7° 55' 2.748" E	23°9'40"N 23°10'0"N 23°10'20"N
	R       RIVER         9       11         .4       11         .4       .1         .5       .1         .1       .1         .1       .1         .1       .1         .23° 11' 41.345" N         .3° 11' 16.846" N    <	12       1314         3°       •         •       •         2       •         •       •        <	"N 23°9'40"N 23°10'0"N 23°10'20"N
	RIVER         11         2       11         2       11         2       11         2       11         2       11         2       11         2       11         2       11         23° 11' 44.937" N       23° 11' 44.937" N         23° 11' 44.328" N       23° 11' 42.016" N         23° 11' 41.345" N       23° 11' 36.179" N         23° 11' 26.487" N       23° 11' 26.487" N         23° 11' 16.846" N       23° 11' 18.623" N	12       1314         3       3         12       1314         3       3         12       1314         3       3         12       1314         3       3         13       3         13       3         14       3         15       3         16       3         17       5         18       3         12       13         14       5         15       3         16       3         17       12         18       3         19       3         10       19         10       19         11       19         12       19         12       10         12       10         12       10         13       19         14       19         14       10         10       10         10       10         11       10         12       10         13       10	20"N 23°9'40"N 23°10'0"N 23°10'20"N
	K         K	12       1314         12       1314         3       -         2       -         3       -         2       -         3       -         2       -         3       -	3°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N
	R       RIVER         9       11         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       1         •       •        <	12       1314         3       3         12       1314         3       3         12       1314         3       3         12       1314         3       3         13       3         13       3         14       5         15       3         16       3         17       5         12       3         13       4         14       5         15       5         15       5         15       5         15       17         16       19         17       19         18       19         19       74         19       74         10       19         10       19         10       19         10       10         10       10         10       10         10       10         11       10         12       10         13       10         14       10	23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N
	RIVER         I        I <thi< th="">        I        <thi< td=""><td>12       1314         12       1314         3       -         2       -         3       -         2       -         3       -         2       -         3       -</td><td>23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N</td></thi<></thi<>	12       1314         12       1314         3       -         2       -         3       -         2       -         3       -         2       -         3       -	23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N
	<b>LATITUDE</b> 23° 11' 44.937" N         23° 11' 44.937" N         23° 11' 44.328" N         23° 11' 42.016" N         23° 11' 42.016" N         23° 11' 42.016" N         23° 11' 46.345" N         23° 11' 36.179" N         23° 11' 16.846" N         23° 11' 16.846" N         23° 11' 10.774" N         23° 11' 3.483" N         23° 11' 3.483" N         23° 10' 55 656" N	12       1314         12       1314         3       2         13       2         3       2         12       1314         3       2         13       2         3       2         14       2         15       2         15       2         16       2         17       2         18       2         19       2         10       2         10       2         11       2         12       3         14       2         15       3         12       2         13       2         14       2         15       3         15       3         16       3         17       14         18       3         18       3         10       10         10       10         11       10         12       10         13       10         14       10         15 <td>0"N 23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N</td>	0"N 23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N
	<b>LATITUDE</b> 23° 11' 44.937" N         23° 11' 44.937" N         23° 11' 44.937" N         23° 11' 44.328" N         23° 11' 42.016" N         23° 11' 41.345" N         23° 11' 36.179" N         23° 11' 16.846" N         23° 11' 16.846" N         23° 11' 10.774" N         23° 11' 10.774" N         23° 11' 3.483" N         23° 11' 3.483" N         23° 10' 55.656" N         23° 10' 54 527" N	12         1314           12         1314           3         -           2         -           12         -           3         -           2         -           2         -           3         -           3         -           2         -           3         -           3         -           3         -           2         -           3	9'0"N 23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N
	LATITUDE 23° 11' 44.937" N 23° 11' 44.937" N 23° 11' 44.937" N 23° 11' 44.328" N 23° 11' 42.016" N 23° 11' 41.345" N 23° 11' 36.179" N 23° 11' 36.179" N 23° 11' 16.846" N 23° 11' 16.846" N 23° 11' 18.623" N 23° 11' 10.774" N 23° 11' 10.774" N 23° 11' 1.483" N 23° 11' 3.483" N 23° 10' 55.656" N 23° 10' 54.527" N 23° 10' 54.527" N	12         1314           3         3           12         1314           3         3           12         1314           3         3           12         1314           3         3           12         1314           3         3           13         3           14         5           3         3           12         1314           3         3           14         5           15         5           15         5           12         13           13         14           15         12           16         12           17         14           18         19           19         74           19         74           19         74           19         74           19         74           19         74           10         74           10         74           10         74           10         74           10         74 </td <td>23°9'0"N 23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N</td>	23°9'0"N 23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N
	LATITUDE           23° 11' 44.937" N           23° 11' 44.937" N           23° 11' 44.937" N           23° 11' 44.328" N           23° 11' 44.328" N           23° 11' 42.016" N           23° 11' 43.45" N           23° 11' 46.846" N           23° 11' 16.846" N           23° 11' 16.846" N           23° 11' 10.774" N           23° 11' 3.483" N           23° 10' 55.656" N           23° 10' 54.527" N           23° 10' 44.162" N           23° 10' 34.414" N	12         1314           12         1314           3         2           12         1314           3         2           12         1314           3         2           12         1314           3         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           2         2           2         2           2         2           2         2           2         2           2         2           3         2           3         2           3         2           3         2           3         2           3         2           3         2           3	23°9'0"N 23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N
	<b>LATITUDE</b> 23° 11' 44.937" N         23° 11' 44.937" N         23° 11' 44.328" N         23° 11' 42.016" N         23° 11' 42.016" N         23° 11' 41.345" N         23° 11' 36.179" N         23° 11' 16.846" N         23° 11' 16.846" N         23° 11' 16.846" N         23° 11' 10.774" N         23° 11' 3.483" N         23° 10' 55.656" N         23° 10' 54.527" N         23° 10' 34.414" N <b>B7°57'40</b> "	12       1314         12       1314         3       2         LONGITUDE       87° 53' 38.217" E         87° 54' 12.612" E       87° 54' 12.612" E         87° 54' 19.744" E       87° 54' 28.675" E         87° 54' 28.675" E       87° 55' 2.748" E         87° 55' 2.748" E       87° 55' 17.143" E         87° 55' 35.268" E       87° 55' 35.268" E         87° 55' 43.510" E       87° 55' 43.510" E         87° 55' 54.547" E       87° 55' 54.547" E         87° 56' 1.284" E       87° 56' 12.142" E         87° 56' 19.444" E       87° 56' 19.444" E	23°9'0"N 23°9'20"N 23°9'40"N 23°10'0"N 23°10'20"N





<b>RIVE</b>	R	
"E 87°58	'0"E 87°58'10"E	
HAMAN 2		23°10'30"N
		23°10'20"N
BBD_BD2_DA	6 5 . 3	23°10'10"N
ATITUDE	LONGITUDE	
10' 27.837" N	87° 57' 21.895" E	
10' 23.726" N	87° 57' 39.712" E	Z
10' 12.583" N	87° 58' 10.980" E	l0,I
10' 12.834" N	87° 58' 8.853" E	-10
10' 11.833" N	8/° 58' 3.728" E	23
10' 12.021" N	8/° 58' 1.123" E	
10' 15.013'' N	8/° 5/° 50./2/° E	
10' 14.808' IN 10' 19 342" N	8/° 5/ 45./90° E 87° 57' 40 511" E	Z
10 18.342 N 10' 18 022" N	87° 57' 36 508" E	20"
10' 18.022' N 10' 18.035" N	87° 57' 20 316" E	16°
10' 16 675" N	87° 57' 17 515" E	23
10' 16.280" N	87° 57' 11.743" E	
10' 17.744" N	87° 56' 59.758" E	
10' 19.413" N	87° 56' 54.093" E	z
10' 20.058" N	87° 56' 47.026" E	40"
10' 21.368" N	87° 56' 43.685" E	-'0°{
10' 28.508" N	87° 56' 40.396" E	23
10' 30.787" N	87° 56' 35.812" E	
0"E 87°58	3'0"E 87°58'10"E	



• 7		ြို့
PBBD_ME1_DA	_16	N N
LATITUDE	LONGITUDE	Z
23° 9' 59.122" N	87° 58' 17.997" E	-0
23° 10' 1.818" N	87° 58' 19.454" E	ů.
23° 9' 59.053" N	87° 58' 33.242" E	
23° 9' 55.577" N	87° 59' 0.908" E	
23° 9' 52.206" N	87° 59' 11.602" E	22
23° 9' 53.608" N	87° 59' 18.535" E	3°8
23° 9' 50.653" N	87° 59' 28.786" E	N I
23° 9' 20.701" N	88° 0' 3.400" E	
23° 9' 14.690" N	88° 0' 7.152" E	-%
23° 9' 8.326" N	88° 0' 7.780" E	3%
23° 9' 13.363" N	87° 59' 50.716" E	
23° 9' 18.914" N	87° 59' 46.296" E	
23° 9' 29.090" N	87° 59' 29.746" E	1.0
23° 9' 39.883" N	87° 58' 51.302" E	3%
23° 9' 41.014" N	87° 58' 29.921" E	
23° 9' 48.731" N	87° 58' 12.384" E	
88°0'30"E	88°0'50"E 88°1'0"E	



88°0'50"E 88°1'0"E

23°10'0"N

23°9'50"N

23°9'40"N

23°9'30"N

23°9'20"N

0"N





RRI	<b>VER</b> 88°0'50"E	
	W S E	
		23°9'20"N
E1_DA DE 1" N 2" N 6" N	<b>17A</b> <b>LONGITUDE</b> 88° 0' 17.268" E 88° 0' 17.305" E 88° 0' 26.711" E	23°9'10"N
0" N 6" N 0" N 6" N 3" N 3" N 9" N 2" N 4" N	88° 0' 32.819" E         88° 0' 32.975" E         88° 0' 30.521" E         88° 0' 27.783" E         88° 0' 26.688" E         88° 0' 18.548" E         88° 0' 15.227" E         88° 0' 16.156" E         88° 0' 15.110" E	23°9'0"N
	88°0'50"E	I



RIVE	<b>R</b> 88°0'50"E	Z.
	N W S S	23°9'20
		23°9'10"N
JL_DA_ JDE 42" N 97" N 72" N 72" N	<b>17B</b> <b>LONGITUDE</b> 88° 0' 15.576" E 88° 0' 18.704" E 88° 0' 20.405" E 88° 0' 20.911" E	23°9'0"N
01" N 58" N 98" N 36" N 52" N 97" N 57" N	88° 0' 19.031" E 88° 0' 21.895" E 88° 0' 21.947" E 88° 0' 19.281" E 88° 0' 16.790" E 88° 0' 11.697" E 88° 0' 11.413" E 88° 0'50"E	23°8'50"N



L_DA_17C		23°8'10"N
PBBD_JL_DA_1	17C	
LATITUDE	LONGITUDE	F
23° 7' 42.874" N	87° 59' 36.781" E	
23° 7' 52.304" N	87° 59' 55.642" E	Z
23° 7' 53.632" N	88° 0' 3.279" E	50
23° 7' 57.046" N	88° 0' 7.584" E	~``
23° 7' 59.770" N	88° 0' 12.255" E	23
23° 8' 8.514" N	88° 0' 17.158" E	
23° 8' 14.955" N	88° 0' 18.973" E	
23° 8' 23.676" N	88° 0' 27.504" E	
23° 8' 27.895" N	88° 0' 26.884" E	-
23° 8' 39.740" N	88° 0' 31.253" E	<b>1</b>
23° 8' 55.229" N	88° 0' 30.717" E	- 20
23° 8' 59.024" N	88° 0' 33.226" E	3°7
23° 8' 52.720" N	88° 0' 37.338" E	N N
23° 8' 40.111" N	88° 0' 39.531" E	
23° 8' 29.694" N	88° 0' 40.079" E	-
23° 8' 19.552" N	88° 0' 38.160" E	
23° 8' 6.120" N	88° 0' 29.663" E	z
23° 7' 30.599" N	87° 59' 35.583" E	0
23° 7' 33.266" N	87° 59' 32.339" E	1
23° 7' 36.110" N	87° 59' 31.522" E	ŝ
23° 7' 40.489" N	87° 59' 32.950" E	
'E 88°1'0"E	88°1'20"E	

88°1'10"E

88°1'30"E

23°8'50"N

23°8'30"N





<b>IVER</b> <sup>**59'40"E</sup>	87°59'50"E	0"N
	W Correction of the second sec	23°7'4
		23°7'30"N
		23°7'20"N
		3°7'10"N
)_JL_DA_	<u>18</u>	й
JDE		
105" IN	87° 59' 10.124" E	
11 IN 85" N	87° 59' 4 973" E	_
97" N	87° 59' 8.263" E	
72" N	87° 59' 13.711" E	23°7
50" N	87° 59' 23.852" E	
97" N	87° 59' 28.714" E	
250" N	87° 59' 22.897" E	
241" N	87° 59' 22.596" E	Z
8 / " IN	8/~ 59' 20.362'' E	5'50
7°59'40"E	87°59'50"E	23°(



<b>RIVE</b> 58'20"E	2 <b>R</b> 87°58'30"E 87°58'40"E	
.5	-	23°2'0"N
		23°1'50"N
JAMA	LPUR	23°1'40"N
)_JL_DA_ UDE		
UDE 102" N	87° 58' 0 707" E	7
503" N	87° 58' 15 345" E	30"
81" N	87° 58' 26.409" E	
339" N	87° 58' 28.848" E	й
740" N	87° 58' 19.278" E	
187" N	87° 58' 4.514" E	Z
457" N	87° 57' 55.995" E	20"
830" N	87° 57' 48.646" E	3.1
845" N	87° 57' 47.428" E	Ň
932" N	87° 57' 45.184" E	
890" N	87° 57' 37.981" E	7
797" N	87° 57' 32.003" E	10"
429" N	87° 57' 27.936" E	3°1-
169" N	87° 57' 28.691" E	Ň
725" N	87° 57' 42.397" E	
'58'20"E	87°58'30"E 87°58'40"E	



			- 23°0'20"N
		100	
NO	PBBD_JL_DA_		Z
NU		LONGITUDE	20
	23° 0° 5.427° N	8/° 5/° 15.011° E	0°C
	23° 0' 10.464" N	8/° 5/° 16.962″ E	53
	23° 0' 14.983" N	8/° 5/° 20.358° E	
	23 0 19.149 N	8/ 3/ 22.331 E 97º 57' 24 021" E	
	23 0 30.039 N	87° 57' 27 046" E	-
	23° 0' 37 405" N	87° 57' 30 061" E	
	23° 0' 30 405" N	87° 57' 31 026" E	z
	23° 0' 37 010" N	87° 57' 32 158" E	, o
	23° 0' 28 341" N	87° 57' 31 539" E	- 6
	23° 0' 24 241" N	87° 57' 26 603" E	ů.
	23° 0' 20 951" N	87° 57' 24 349" E	2
	23° 0' 17 856" N	87° 57' 23 993" E	
	23° 0' 8.024" N	87° 57' 28.050" E	
	23° 0' 5.242" N	87° 57' 27.027'' E	
	23° 0' 5.679" N	87° 57' 23.127" E	
	22° 59' 59.058" N	87° 57' 17.050" E	Z
	22° 59' 45.554" N	87° 57' 4.696" E	N.
	22° 59' 39.492" N	87° 56' 59.858" E	-0
	22° 59' 32.421" N	87° 56' 50.999" E	2 2
	22° 59' 29.943" N	87° 56' 51.093" E	52
	22° 59' 26.858" N	87° 56' 49.064" E	
	22° 59' 18.227" N	87° 56' 42.090" E	
	22° 58' 57.100" N	87° 56' 35.810" E	
	22° 58' 59.708" N	87° 56' 34.568" E	
	22° 59' 10.244" N	87° 56' 35.882" E	Z
	22° 59' 22.647" N	87° 56' 40.518" E	0
	22° 59' 31.145" N	87° 56' 48.918" E ຊ	29-
	22° 59' 38.927" N	87° 56' 52.898" E	β
	23° 0' 1.372" N	87° 57' 10.051" E	
''40	)"E 87°58'	0"E 87°58'2	0"E

87°58'0"E

87°58'20"E

23°0'40"N



RIVER		
'E 8	8°0'0"E 88°0'10"E	
	W E	
		23°5'10"N
		23°5'0"N
	18C	23°4'50"N
<u>JL_DA</u> UDE 27" N	LONGITUDE	
430" N	87° 59' 27.057' E 87° 59' 34.463'' E	°4'40"N
639" N 938" N	87° 59' 31.913" E 87° 59' 32.004" E	23
333" N	87° 59' 31.790'' E	
513" N	87° 59' 31.077" E	30"N
505" N	87° 59' 16.411'' E	23°4
287" N	87° 59' 19.817" E	
399" N	87° 59' 22.667" E	
"E ;	88°0'0"E 88°0'10"E	J



7°58'20"E	87°58'50"E	87°59'20	"Е
1000	Contraction of the	1 2 3 3	
BD_RN2_DA	A_19		0"\
TITUDE	LONGIT	UDE	- 60
27.935" N	87° 56' 23.8	855" E	22°5
28.786" N	87° 56' 17.6	571" E	
39.586" N	87° 56' 19.8	390" E	L
45.159" N	87° 56' 20.2	225" E	Ţ
51.000" N	87° 56' 21.7	752" E	-0,6
55.204" N	87° 56' 20.8	889" E	2°5
" 1.156" N	87° 56' 21.1	89" E	-~
" 2.780" N	87° 56' 20.0	010" E	
" 3.245" N	87° 56' 21.5	596" E	ŗ
10.131" N	87° 56' 22.3	330" E	30
18.395" N	87° 56' 21.5	569" E	°58
20.647" N	87° 56' 24.8	855" E	22
27.395" N	87° 56' 24.4	456" E	
40.046" N	87° 56' 26.6	599" E	
53.056" N	87° 56' 26.4	17" E	0"\
17.948" N	87° 56' 30.4	455" E	-28
22.896" N	87° 56' 31.7	753" E	22°
32.045" N	87° 56' 32.7	708" E	-
36.375" N	87° 56' 33.7	79" E	
50.199" N	87° 56' 35.4	436" E	0"N
18.086" N	87° 56' 45.0	)71" E	7'3(
36.507" N	87° 57' 0.7	37" E	2°5
36.360" N	87° 57' 2.3	72" E	-~
33.456" N	87° 57' 4.5	24" E	
11.607" N	87° 56' 55.0	)66" E	z
58.530" N	87° 56' 51.0	043" E	-0, -
15.739" N	87° 56' 36.1	76" E	2°5
51.291" N	87° 56' 34.7	720" E	- <sup>61</sup>
14.930" N	87° 56' 30.1	05" E	
56.525" N	87° 56' 31.2	243" E	╞
47.468" N	87° 56' 25.5	518" E	
39.343" N	87° 56' 25.9	908" E	F
7°58'20"E	87°58'50"E	87°59'2	• 0"E











		07°46120115	
37*45*10	"E 87"45"20"E	87°45'30"E	
		22°58'50"N	
		22°58'40"N	
12_DW	04	ZO	
E U D T		287	
" N	87° 44' 24.848'' E	22°ť	
" N " N	8/° 44' 26.051'' E		
IN "N	$87^{\circ} 44 27.882$ E		
" N	87° 44' 33.718' L 87° 44' 32 914'' F	<b>20"</b>	
" N	87° 44' 34 396" F	°58'	
" N	87° 44' 34.251" F	53	
'N	87° 44' 33.741" F	E	
'N	87° 44' 34.624" E	E Z	
'N	87° 44' 34.693" E	<b>3.10</b>	
'N	87° 44' 34.298" F	2°58	
N	87° 44' 33.366" E	S S	
" N	87° 44' 29.967" E	E	
" N	87° 44' 29.885" E	E Z	
" N	87° 44' 26.384" E	E -28.0	
" N	87° 44' 25.764" E	<b>22°!</b>	
87°45'10	)"E 87°45'20"E	87°45'30"E	



	87°45'	30"E	87°45'40"E	
				1
		PBBD_RN2_DW	/_05	
	POINT NO	LATITUDE	LONGITUDE	
	1	22° 57' 53.062" N	87° 45' 37.415" E	
	2	22° 57' 52.247" N	8/° 45' 40.453" E	
	3	22° 57' 51.005" N	8/° 45' 35.164" E	Z
		22 37 47.003 N 22° 57' 47 472" N	87° 45' 25 556" E	Ó
	6	22° 57' 43.003" N	87° 45' 9 996" E	- 20
	7	22° 57' 40 413" N	87° 45' 4 630" E	22
	8	22° 57' 39 889" N	87° 45' 2 396" E	ŝ
	9	22° 57' 40.940" N	87° 45' 0.000" E	N
	10	22° 57' 41.046" N	87° 44' 56.394" E	
	11	22° 57' 41.961" N	87° 44' 53.116" E	
	12	22° 57' 46.438" N	87° 44' 51.078" E	
	13	22° 57' 51.947" N	87° 44' 40.980" E	
	14	22° 57' 54.299" N	87° 44' 39.211" E	
	15	22° 57' 59.679" N	87° 44' 36.862" E	
	16	22° 58' 7.327" N	87° 44' 35.194" E	
	17	22° 58' 12.147" N	87° 44' 34.849" E	
	18	22° 58' 14.052" N	87° 44' 38.423" E	
	19	22° 58' 8.194" N	87° 44' 40.180" E	Lm
	20	22° 58' 0.58/" N	8/° 44' 43.305" E	ũ
	21	22° 57' 51.048" N	87° 44° 50.295" E	Ň
	22	22 37 49.197 N	87° 44' 52.885' E	
	23	22° 57' 46 402" N	87° 45' 10 031" E	
	25	22° 57' 48 211" N	87° 45' 18 501" E	
	26	22° 57' 52,166" N	87° 45' 31.543" E	
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87°45'30"E

87°45'40"E

'30"

22°57'



AR RIV 87°46'0"E	ER	
		22°57'50"N
PBBD_RN2_DW LATITUDE ° 57' 40.116" N	/_06 LONGITUDE 87° 45' 53.997" E	22°57'40"N

LATITUDE	LONGITUDE		
° 57' 40.116" N	87° 45' 53.997" E		
° 57' 40.197" N	87° 45' 51.920" E		
° 57' 41.610" N	87° 45' 51.516" E		
° 57' 45.228" N	87° 45' 47.816" E		
° 57' 48.106" N	87° 45' 41.593" E		
° 57' 48.019" N	87° 45' 33.206" E		
° 57' 48.955" N	87° 45' 35.079" E		
° 57' 49.270" N	87° 45' 38.291" E		
° 57' 49.836" N	87° 45' 40.792" E		
° 57' 49.657" N	87° 45' 43.690" E		
° 57' 48.602" N	87° 45' 48.278" E		
° 57' 45.203" N	87° 45' 50.845" E		
° 57' 43.663" N	87° 45' 53.290" E		
° 57' 41.323" N	87° 45' 53.504" E		

87°46'0"E



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





Annexure 6 SEIAA 73<sup>rd</sup> Meeting (8<sup>th</sup> September, 2022) Minutes of Meeting .....

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

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#### Subject:- 73rd meeting of SEIAA

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

From :- 08 September 2022

To :-08 September 2022

#### 1. Proposal No. :- SIA/WB/IND2/152174/2020 File No- EN/T-II-1/013/2020

Proposed Exploratory Drilling (10 wells) in NELP VII Block WB-ONN-2005/4, situated in North Type-24 Parganas and Nadia Districts, West Bengal by M/s. Oil & Natural Gas Corporation Limited, EC **HSE MBA Basin** 

#### INTRODUCTION

The proponent made online application vide proposal no. SIA/WB/IND2/152174/2020 dated 17 Jul 2020 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. 1(b) Offshore and onshore oil and gas exploration, development & production, 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 condition:

1. Short term need-based activities to be identified and implemented. Name of the beneficiary should be displayed at site.

1	State of the project			
S. No.	State	District	Tehsil	Village
1.	West Bengal	Nadia	Ranaghat - I	Noapara
2.	West Bengal	Nadia	Ranaghat - II	Matikumra
3.	West Bengal	Nadia	Haringhata	Haringhata
4.	West Bengal	North 24 Parganas	Habra - I	Asokenagar
5.	West Bengal	North 24 Parganas	Habra - II	Beraberi

#### PROJECT DETAILS

The production details / project configuration is as follows

Project configuration/product details

S. No.	Project configuration/product details	Quantity	Unit	Other Unit	Mode of Transport/Transmission of Product	Other Mode of Transport
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The salient features of the project submitted by the project proponent is available at <u>Report</u> under online proposal no. SIA/WB/IND/278173/2022

#### DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

Approved extension of validity of Environmental Clearance.

Conclusion

Recommended

#### MISCELLANEOUS

 Discussion on draft DSRs of Purba Medinipur, Paschim Medinipur and Purba Bardhaman.

DSRs of Purba Medinipur, Paschim Medinipur and Purba Bardhaman are approved.

 ToR application for the proposed Modification of "Aerotropolis Township" at Andal, Vill.

 Tamla, Dhokinkhanda, Mahira, Khandra, Amloka, Banguli, Durgapur Taluk, District: Paschim Bardhhaman, West Bengal by M/s. Bengal Aerotroplis project Limited. Proposal No. SIA/WB/MIS/80933/2022.

#### Background

Earlier M/s. Bengal Aerotroplis project Limited had obtained EC from SEIAA, WB vide No. EN/2041/T-II-1/025/2009 dated 11.08.2011 for Greenfield Aerotropolis Township (Phase I) at Andal, Vill. – Tamla, Dhokinkhanda, Mahira, Khandra, Amloka, Banguli, Durgapur Taluk, District: Burdwan, West Bengal.

Now the PP has applied for modification of "Aerotropolis Township" at Andal, Vill. – Tamla, Dhokinkhanda, Mahira, Khandra, Amloka, Banguli, Durgapur Taluk, District: Paschim Bardhhaman, West Bengal.

The matter was placed in the 69<sup>th</sup> meeting of SEIAA held on 10.08.2022 and it was decided to request the project proponent to mention the exact distance of the project area from the municipal limits of Durgapur and also submit Google earth image showing the Lat-Long of the proposed project area along with the municipal limits of Durgapur since the location of the proposed project area appears to be close to Durgapur Municipal Corporation area, which is declared as a 'Severely Polluted Area'.

The project proponent submitted reply vide their letter Ref No. BAPL/DGP/INFRA(PI)/L/MS-SEIAA/22-23/269 dated 29.08.2022 uploaded on 30.08.2022.

SEIAA considered the reply submitted by the PP and in view of the O.M. No. 22-23/2018-IA.III[E115231] dated 05.07.2022 of MoEF&CC, the above project which is categorised as a 'B1' project is transferred to MoEF&CC for further necessary action.

	***
	State Environment Impact Assessment Authority
	West Bengal
	Minutes of SEIAA Meeting
	***
Subject:	30 <sup>th</sup> meeting of SEIAA (Reconstituted on 17.05.2023)
Venue:-	Conference Room of Environment Department, Prani Sampad Bhavan, 5 <sup>th</sup> 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 22<sup>nd</sup> meeting held on 20.12.2023, recommended the proposed project for Environmental Clearance.

The proposal was placed before SEIAA in its 28<sup>th</sup> 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		
CONSID	ERATION/RECONSIDERATION OF ENVIRONMENTAL CLEA	ARANCE		
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 <b>M/s. Pacific Plywoods Pvt. Ltd.</b> (Proposal No. <b>SIA/WB/IND3/435073/2023</b> )	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 <b>Sankar Das.</b> (Proposal No. <b>SIA/WB/MIN/447148/2023</b> )	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 <b>Sheikh Mursed Ali</b> . (Proposal No. <b>SIA/WB/MIN/260697/2022</b> )	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 <b>M/s. RKC Infrastructure</b> <b>Private Limited.</b> (Proposal No. <b>SIA/WB/MIN/446272/2023</b> )	Approved for Environmental Clearance		
CONSID	FRATION 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 <b>M/s. Saraogi Shellac and Aromatics.</b> (Proposal No. <b>SIA/WB/IND3/449388/2023</b> )	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 <b>M/s. Shree Cement North Private Limited.</b> (Proposal No. <b>SIA/WB/IND1/404126/2022</b> )	Absent		

Sl. No.	Proposal	Summary Decision
2.	Processing of sand mining applications	a) Proposals are already under
	<ul> <li>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.</li> <li>b) Request letter from project proponents whose applications were rejected because of date of application being beyond 60</li> </ul>	<ul> <li>processing and after disposal the same would be communicated to Hon'ble NGT.</li> <li>b) All the rejected applicants for DSD discussion with the same would be communicated to Hon'ble NGT.</li> </ul>
	days of date of uploading of DSR in the District website.	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**

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### **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.

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	

Table 1: Distribution of chapters in the DSR

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- 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.
- 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. <u>Hyperlink of District boundary modification</u>



Figure 1: Map showing changes in district boundary




Figure 2: Map showing major shifting in district boundary

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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	Considere d 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)	Resourc e modific ation (million cubic meter)
1	Ajay	3	2.17	3.91	3.74	6.74	2.83
2	Damodar	2.7	23.88	38.68	30.70	49.73	11.05
3	Dwarakeswa r	3	0.90	1.61	1.06	1.91	0.30

7. Sandbar addition/deletion are highlighted below:

RIVER	SANDBAR AS PAER APPROVED DSR	SANDBAR AS PER MODIFIED DSR	REMARKS	
		PBBD_AS2_AJ_01P	-	
		PBBD_AS2_AJ_01Q		
		PBBD_AS2_AJ_01R		
		PBBD_AS2_AJ_01S		
		PBBD_AS2_AJ_01T	Added based on 2022 satellite image	
		PBBD_AS2_AJ_01U		
		PBBD_AS2_AJ_01V		
		PBBD_AS2_AJ_01W		
		PBBD_AS2_AJ_01X		
		PBBD_AS2_AJ_01Y		
		PBBD_AS2_AJ_01Y_I		
		PBBD_AS2_AJ_01Y_II		
		PBBD_AS2_AJ_01Y_III		
AJOY		PBBD_AS2_AJ_01Z		
		PBBD_AS2_AJ_01Z_I		
	PBBD_KG1_AJ_04	PBBD_KG1_AJ_04	No changes	
	PBBD_KG1_AJ_05_06	PBBD_KG1_AJ_05_06	No changes	
	PBBD_KG1_AJ_09_10	PBBD_KG1_AJ_09_10	No changes	
	PBBD_KG1_AJ_11	PBBD_KG1_AJ_11	No changes	
		PBBD_KG1_AJ_11A	Added based on 2022 satellite image	
	PBBD_KG2_AJ_14	PBBD_KG2_AJ_14	No changes	
	PBBD_KG2_AJ_14A	PBBD_KG2_AJ_14A	No changes	
		PBBD_KG2_AJ_14B	Added based on 2022 satellite image	
	PBBD_KG2_AJ_15	PBBD_KG2_AJ_15	No changes	
	PBBD_KG2_AJ_16	PBBD_KG2_AJ_16	No changes	
	PBBD_KG2_AJ_19	PBBD_KG2_AJ_19	No changes	
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RIVER	SANDBAR AS PAER APPROVED DSR	SANDBAR AS PER MODIFIED DSR	REMARKS
	PBBD_KG2_AJ_20	PBBD_KG2_AJ_20	No changes
	PBBD_KG2_AJ_21		Deleted due to bridge buffer
	PBBD_KG2_AJ_22	PBBD_KG2_AJ_22	No changes
		PBBD_KG2_AJ_25	Added based on 2022 satellite image
	PBBD_KT1_AJ_18	PBBD_KT1_AJ_18	No changes
		PBBD_KT1_AJ_20A	Added based on 2022 satellite image
		PBBD_KT1_AJ_21	Added based on 2022 satellite image
	PBBD_KT1_AJ_21A	PBBD_KT1_AJ_21A	No changes
	PBBD_KT1_AJ_23	PBBD_KT1_AJ_23	No changes
	PBBD_MK_AJ_01	PBBD_MK_AJ_01	No changes
		PBBD_MK_AJ_01A	
		PBBD_MK_AJ_01A_I	
		PBBD_MK_AJ_01B	
		PBBD_MK_AJ_01C	
		PBBD_MK_AJ_01D	
		PBBD_MK_AJ_01D_I	
		PBBD_MK_AJ_01E	
		PBBD_MK_AJ_01F	Added based on 2022
		PBBD_MK_AJ_01G	satellite image
		PBBD_MK_AJ_01H	satemite mage
		PBBD_MK_AJ_01I	
		PBBD_MK_AJ_01J	
		PBBD_MK_AJ_01K	
		PBBD_MK_AJ_01L	
		PBBD_MK_AJ_01M	
		PBBD_MK_AJ_01N	
		PBBD_MK_AJ_01O	
	PBBD_MK_AJ_03	PBBD_MK_AJ_03	No changes
		PBBD_MK_AJ_03A	Added based on 2022
		PBBD_MK_AJ_03B	satellite image
	PBBD_MK_AJ_07_08	PBBD_MK_AJ_07_08	No changes
	PBBD_MK_AJ_12	PBBD_MK_AJ_12	No changes
	PBBD_MK_AJ_17	PBBD_MK_AJ_17	No changes
	PBBD_BD1_DA_10(XA)	PBBD_BD1_DA_10(XA)	No changes
	PBBD_BD1_DA_10(XB)	PBBD_BD1_DA_10(XB)	No changes
	PBBD_BD1_DA_10_12	PBBD_BD1_DA_10_12	No changes
DAMODAR	PBBD_BD1_DA_12(XIIA)	PBBD_BD1_DA_12(XIIA)	No changes
	PBBD_BD1_DA_12(XIIB)	PBBD_BD1_DA_12(XIIB)	No changes
	PBBD_BD2_DA_13(XIIIB)	PBBD_BD2_DA_13(XIIIB)	No changes
	PBBD_BD2_DA_14	PBBD_BD2_DA_14	No changes

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RIVER	SANDBAR AS PAER APPROVED DSR	SANDBAR AS PER MODIFIED DSR	REMARKS	
	PBBD_BD2_DA_15(XVA)	PBBD_BD2_DA_15(XVA)	No changes	
	PBBD_BD2_DA_15(XVB)	PBBD_BD2_DA_15(XVB)	No changes	
	PBBD_BD2_DA_15A	PBBD_BD2_DA_15A	No changes	
	PBBD_GL1_DA_01(IA)	PBBD_GL1_DA_01(IA)	No changes	
	PBBD_GL1_DA_01(IB)	PBBD_GL1_DA_01(IB)	No changes	
	PBBD_GL1_DA_01A			
	PBBD_GL1_DA_02(IIA)		Deleted for modifing	
	PBBD_GL1_DA_02(IIB)			
	PBBD_GL1_DA_02(IIC)		district boundary	
	PBBD_GL2_DA_03(IIIA)			
	PBBD_GL2_DA_03(IIIB)	PBBD_GL2_DA_03(IIIB)	No changes	
	PBBD_GL2_DA_03(IIIC)	PBBD_GL2_DA_03(IIIC)	No changes	
	PBBD_GL2_DA_03(IIID)	PBBD_GL2_DA_03(IIID)	No changes	
	PBBD_GL2_DA_03(IIIE)	PBBD_GL2_DA_03(IIIE)	No changes	
	PBBD_GL2_DA_03_04	PBBD_GL2_DA_03_04	No changes	
	PBBD_GL2_DA_05	PBBD_GL2_DA_05	N 1	
	PBBD_GL2_DA_06	PBBD_GL2_DA_06	No changes	
	PBBD_GL2_DA_08	PBBD_GL2_DA_08	No changes	
		PBBD_JL_DA_17B		
		PBBD_JL_DA_17C		
		PBBD_JL_DA_17D	Added based on 2022	
		PBBD_JL_DA_18	satellite image	
		PBBD_JL_DA_18A		
		PBBD_JL_DA_18B		
	PBBD_KH_DA_07	PBBD_KH_DA_07	No changes	
	PBBD_KH_DA_09	PBBD_KH_DA_09	No changes	
	PBBD_KH_DA_09_11	PBBD_KH_DA_09_11	No changes	
	PBBD_ME1_DA_16	PBBD_ME1_DA_16	No changes	
		PBBD_ME1_DA_17	A 11 11 1 0000	
		PBBD_ME1_DA_17A	Added based on 2022	
		PBBD_RN2_DA_19	satemite mage	
	PBBD_KH_DW_01	PBBD_KH_DW_01	No changes	
	PBBD_KH_DW_02(IIA)	PBBD_KH_DW_02(IIA)	No changes	
		PBBD_KH_DW_02(IIA)_1	Added based on 2022 satellite image	
DWARAKE	PBBD_KH_DW_02(IIB)		Deleted due to bridge buffer	
SWAR	PBBD_RN2_DW_04	PBBD_RN2_DW_04	No changes	
	PBBD_RN2_DW_05	PBBD_RN2_DW_05	No changes	
	PBBD_RN2_DW_06	PBBD_RN2_DW_06	No changes	
		PBBD_RN2_DW_03A	Added based on 2022 satellite image	

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