



REPORT

ON



ASSESSMENT OF EXTRACTABLE RIVER BED MATERIAL FROM RIVER SONG I, II & III AND JAKHAN I&II AT DEHRADUN FOR THE YEAR 2019-20

FOR

Divisional Logging Manager (Khanan), Uttarakhand Forest
Development Corporation, Dehradun (Uttarakhand)



BY

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(Jan. 2020)



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FROM RIVER SONG I, II & III AND JAKHAN (B) AT
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(Jan. 2020)

EXECUTIVE SUMMARY

A study was undertaken by ICAR- Indian Institute of Soil and Water Conservation (formerly CSWCRI), Dehradun (Uttarakhand) under a consultancy project sponsored by Divisional Logging Manager (Khanas), Uttarakhand Forest Development Corporation, Dehradun (Uttarakhand) on "Assessment of extractable river bed material from river Song I, II & III and Jakhua I&II at Dehradun for the year 2019-2020" in the defined reach of the river.

Based on the survey conducted during pre and post monsoon 2019-20, it has been observed that the extraction has been made randomly from the river thus attracting the meandering flow.

Based on the survey, assessment of the sediment deposits it is assessed that the safe limit for extraction / removal of deposited river material from Song and Jakhua 2019-20 is **851895.1m³ and 374526.27 m³** respectively. This quantity has been arrived upon considering that hydrological profile of the river flow is guided to the centre of the river so as to minimize risk of stream bank erosion.

The following recommendations for future are also made for the assessment of permissible quantity of RBM to be made from the river and the methodology of extraction to be followed so as to maintain the hydrological profile of the river along with the extraction of the RBM.

1. As the method and depth of extraction of RBM to be made will depend upon the pattern and quantity of RBM deposited during the monsoon, hence the quantity of RBM extraction is to be estimated by surveying the river preferably before the monsoon (after extraction of RBM is over i.e. in the month of June) and after the monsoon is over (before the extraction of RBM starts i.e. in the month of November/ December).
2. The extraction duration of RBM in the seasonal river Song and Jakhua may be kept from January to May.
3. The very big boulders in the river should not be removed from the junction of the hilly area and plain area as these big boulders serve for dissipating the energy of the flowing water.

4. The extraction may be carried out as per the methodology explained in the report and the concerned authorities responsible for extraction may please be communicated accordingly.
5. As explained to the staff present during survey, permanent pillars on both sides of the river at every one kilometre of length may be erected as permanent bench post. Further the pillars constructed to demarcate width of extraction leaving 25 % of river width from the bank may be erected with a depth of 1.5 m below the ground and 1.2 m above the ground. Probably this may not be carried over by river during monsoon and hence reduce the periodical construction of pillar every year. However this year only 5-6 such pillars may be erected to observe its stability. While erecting the pillar, the corner of the pillar may face upstream.
6. The four pillars are to be constructed to help in confining the extraction of RBM may please be marked from the right hand side of the river to the left hand side of the river as 1/1, 1/2, 1/3, and 1/4 starting from zero length of the river and then at the interval of about 1 Km distance in the river length till the last of the river reach up to which the extraction of RBM is made. These will serve as the permanent bench mark for the survey of the cross section.
7. It has been observed that Song-III and Jakhua-II reach from 0.5 km from upper portion to 2.0 km is having very low deposition of RBM and the agency responsible for extraction of RBM may be advised appropriately to avoid the disturbance of flow course.

Consultancy Project

DA

**"Assessment of extractable river bed material from river Song I, II & III and
Jakhni I&II at Dehradun for the year 2019-20"**

**Under Divisional Logging Manager (Khanan), Uttarakhand Forest Development
Corporation, Dehradun (Uttarakhand)**

Introduction

The mountain river, specially of Himalayas, bring down huge quantity of land mass broken into clay, silt, sand and boulders of various sizes (small gravels to very big stones weighing in tonnes) while traveling with high velocity on the steep slopes of the stream/river. The heavy material (small gravels and stones) roll over the stream surface and get deposited while coming to the foot hills with mild slope due to reduction in the velocity. The coarse / fine particle like sand, silt and clay are further carried and get deposited in mild slopping areas where the velocity further reduces. The very fine clay particle, which remain in suspension are further carried to the sea through river and get deposited in the plains during overflowing of the river.

The heavy and coarse material when gets deposited in the foothills (plain river bed with mild slope), it obstructs the subsequent flow of water carrying more land mass material. This results in change of river course to the sides. This process continues and the river encroaches on either side of the river thus increasing the total width of the river though the actual flow width is much less. Further the encroachment on either side also damages/destroys the valuable property/plantation/agriculture lying there and hence needs some management practices to avoid such phenomena. Sometimes the river flows full of its width also thus accelerating the erosion of weak bank.

The extraction/removal of this erratic deposited material from these river beds periodically may maintain the course of river within prescribed banks/boundaries. However if the extraction/removal, is not carried out properly, may further aggravate the problem. The proper way to prevent a river from damaging the banks is to channelize/centralize the flow at the centre of the river bed. Hence a proper methodology needs to be followed while extracting/removing the deposited river bed material (RBM) from the river bed. In view of the source of construction material for various civil works and revenue to the Government it

is not advisable to promote the extensive & unscientific extraction from the river. A length of 0.5 Km on either side of the bridge (upstream and downstream) has also been left from extraction of RBM from safety point of view for the further damage to the bridge.

The ICAR-IISWC (Formerly CSWCRI), Dehradun had undertaken a consultancy project during the year 2019-2020 on "Assessment of extractable river bed material from river Song I, II & III and Jakhan I&II at Dehradun for the year 2019-20" at the request of the Divisional Logging Manager (Khanan), Uttarakhand Forest Development Corporation, Dehradun(Uttarakhand)

The river site was visited and surveyed during 2019-2020 by Dr.S.K Sharma, Chief Technical Officer, Dr. C.S. Tiwari, Asst Chief Technical Officer, Sh. ILS Bhatia, Technical Officer, and Mr. Ashok Kumar, Chief Technical Officer of ICAR-IISWC, Dehradun along with the officials of Forest Corporation, for detailed field survey.

Objectives of the study

The study has been conducted with the following objectives:

1. Study of the hydrological profile of River Song and Jakhan (for the defined river reach) with respect to the extraction of river bed material
2. Estimation of permissible extraction of river bed material (RBM) for the year 2019-20

Description of River Song and Jakhan

The geographic location of the Song and Jakhan river basin extends from 30°25'26"N to 30°25'36"N Latitude and 78°05'15"E to 78°05'15"E longitude. A total area of the watershed is about 95635 ha (Fig. 2) Topography of the area exhibits distinct variation and contains moderate slope to surround by steep hills and rugged land features. Thus, Song and Jakhan catchment can be divided into a narrow steep upper catchment draining the flanks of Mount Himalayas range, and the remainder on relatively flat plateau sloping gently west wards. The altitude ranges from 351 to 2764 msl. The nature of the topographical features has made the area very liable to heavy gully formation and extensive soil erosion. The Song and Jakhan river basin is a tributary of the Ganga River.

Collection and analysis of basic information

A. Preparation of watershed map

Assessment of drainage pattern and their quantitative analysis provides background information about the hydrological conditions and nature of rock formation exposed within the watershed.

In the present write-up an integrated use of multispectral satellite data, digital elevation model (DEM) was utilized for generation of database and extraction of various drainage parameters (Fig. 2). The following procedure was followed for watershed analysis.

a. The SOI toposheets were geometrically rectified and geo-referenced by taking ground control points (GCPs) by using UTM projection and WGS 84 datum.

b. Catchment area of the Song and Jaldhar river basin delineated from SRTM DEM and Survey of India topographical sheets of the study area by using data preparation option of Imagine processing software by making AOI (Area of Interest) of the basin and same AOI was used to cut the satellite Image of the study area.

c. Satellite Image is utilized to generate the land use/land cover map and updation of drainage map of the basin.

d. Digital Elevation Model (DEM) of the catchment was extracted from Shuttle Radar Topographic Mission (SRTM) data obtained during 2018 with resolution of 30- m (downloaded from the US Geological Survey website). The SRTM DEM was utilized to prepare topographic, slope and delineation of drainage map of the basin Using Spatial Analyst tool of ArcGIS.

B. Preparation of Slope map

Slope is the measure of change in surface value over distance and can be expressed in degrees or as a percentage. In a raster format, the Digital Elevation Model (DEM) is a grid where each cell is a value referenced to a common datum. For extraction of elevation from remote sensing dedicated software packages are required but most GIS packages have routines for point or contour line interpolation. Any two points on the grid will be sufficient to ascertain a slope. Once the slopes have been calculated, then the maximum difference can be found and the gradient can be determined. In the present write-up topographical elevation map for the study area was developed by Digital Elevation Model (DEM) extracted from the Shuttle Radar Topography Mission (SRTM) data. For this, the DEM was subjected to two

directional gradient filters (one in x-direction and another in y direction). The resultant maps were used to generate a slope map of the study area using ArcGIS Spatial Analyst tools. The highest topographic elevations exist in the northeastern portions of the area which induces highest runoff and hence less possibility of rainfall infiltration. The slope map of the study area has grouped in five classes in degrees viz. 0-7° (Moderate), 7-17.5° (Steep), 17.5-27.5° (Very Steep) and >27.5° (Very Very Steep) (Fig. 3). While slope map of the study area has also grouped in five classes in percentage viz. <10, 10-23, 23-36, 36-50 and >50 (Fig. 4). It was found that lower portion of the watershed areas mostly fall within <23 percent and upper portion was comprised by 65 percent of area which is indicating that the most of the watershed area fall within the very steep slope. Steep slopes lead to high runoff generation and cause the erosion at upper portion of watershed.

It is observed that the most of the area of Song and Jukhan river basin comes under moderate to steep slope which indicates almost hilly topography of the area. Moderate to steep slopes were designated in the "highly eroded land" category. The steep class having a high surface runoff which causes the scouring of stream banks leads to very high erosion.

The RBM brought down from slopes of the catchment and getting deposited in order to channelize the river and keep the banks protected, the removal of the RBM is required. Further the RBM is also a very good construction material and fetches revenue. Hence instead of using the word removal the use of word extraction of RBM is more relevant. The river when coming down to mild slopes (along with RBM) from steep slopes dissipates its energy and thus deposits the RBM brought along with it. The heavy materials (boulders) are deposited first followed by small material (bajari and sand). The finer soil particles (silt and clay) are carried over further down. Further longitudinal section has been drawn after surveying the entire river reach under study using Total Station and GPS and observed a uniform slope of 1.2 percent (Fig. 5).

C. Flow Direction and contour map:

The contour map also indicates that the slope in the river reach varies from gentle to high. The flow of water tends towards the centre even in some portion width near banks, areas are diverting water towards center is suggesting that the area near banks are stabilized and the effective width reduces to the central portion which is the impact of extraction. (Fig.6).

B. Factors of composition of institutions

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It is conventional that the structure may be indicated in the picture above without $\mathbf{A}_1, \mathbf{A}_2$ and $\mathbf{A}_3$ as the only possible half-planes. (Indeed, define $\mathbf{M}_1, \mathbf{M}_2, \mathbf{M}_3 \in \mathbf{P}_{\mathbb{R}^3}$.) The sign of extension may also be derived as above in the same manner as defined above $\mathbf{A}_1, \mathbf{A}_2, \mathbf{A}_3$. Further, the sign may also be indicated with the picture extended in different directions. (2) *Generalization to n -dimensional*.

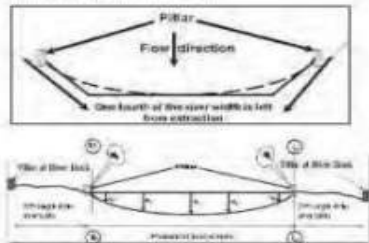


Fig. 3. A longitudinal section of the skin of an embryo at stage 42 of development.

Methodology for assessment of cross section of extraction of RBM

It was suggested by the ICAR-IISWC, Dehradun through previous reports that the extraction / removal of the deposited RBM from these rivers be made leaving 25 % width of the river on either side of the river (Fig.1). The recommendation to restrict the flow to the middle half of the river was to ensure the stability of the river bank and also to rehabilitate the reclaimed area by suitable plantation etc. This would help in channelization and centralization of the river which is very much relevant from river training point of view. In absence of the periodically channelization / centralization of the river material deposited-foothills-river, the tendency of periodical flooding of the adjoining area on the river bank exists. It further accelerates the stream bank cutting also.

The extraction / removal of the deposited river material should be executed in a scientific manner which will help in channelization / centralization of the river flow. The maximum depth of cut should be from the middle of the river course and it should be nil at the boundary of the middle half of the river (Fig.1).

If this method is adopted, the river is likely to take a parabolic shape (Fig.1). It will not happen in a year or two but the extraction/removal like this for years may lead to this ideal situation. However the river material brought due to a heavy discharge in a particular year of long duration probability may hamper this. But this is what we need to do.

Recommendations

1. As the method and depth of extraction of RBM to be made will depend upon the pattern and quantity of RBM deposited during the monsoon, hence the quantity of RBM extraction will be estimated by surveying the river before the monsoon (after extraction of RBM is over i.e. in the month of June) and after the monsoon is over (before the extraction of RBM starts i.e. in the month of November/ December).
2. The extraction duration of RBM in the seasonal river Malan may be kept from January to May.
3. The very big boulders in the river should not be removed from the junction of the hilly area and plain area as these big boulders serve for dissipating the energy of the flowing water.
4. The extraction may be carried out as per the methodology explained in the report and the concerned authorities responsible for extraction may please be communicated accordingly.
5. As explained to the staff present during survey and communicated in the earlier report and in this report as well, permanent pillars on both sides of the river at every one kilometer of length may be erected as permanent bench post. Further the pillars constructed to demarcate width of extraction leaving 25 % of river width from the bank may be erected with a depth of 1.5 m below the ground and 1.2 m above the ground. Probably this may not be carried over by river during monsoon and hence reduce the periodical construction of pillar every year. However this year only 5-6 such pillars may be erected to observe its stability. While erecting the pillar, the corner of the pillar may face upstream.
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7. It has been observed that Song-III and Jakhas-II reach from 0.5 km from upper portion to 2.0km is having very low deposition of RBM and the agency responsible for extraction of RBM may be advised appropriately to avoid the disturbance of flow course.

Acknowledgements

The project team is grateful to Dr. P.K. Ghosh, Director, ICAR-IISWC, Dehradun for approving this project and providing necessary support and facilities. The team is thankful to Divisional Logging Manager (Khasi), Uttarakhand Forest Development Corporation, Dehradun (Uttarakhand) for sponsoring this project and providing all help and facilities for timely completion of this study. The logistic and field assistance provided by the officers and staff of Forest Corporation are thankfully acknowledged. The help rendered by Dr. Chandra Roy, Technical Assistant, during survey and analysis is also appreciated.



**S.S. Shrivastava (Project Leader)
and Consultant Team
ICAR-IISWC, Dehradun (Uttarakhand)**

Morphological studies for the stream Song I, II, III and Jakhan I, II

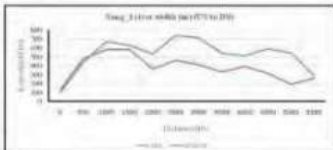
Morphological study was carried out for the stream reaches under the survey. Two time line satellite images 2010 of Google earth and LANDSAT 7 image (PCC) 2020 were taken to study the impact of ongoing RBM extraction activities in the stream reaches of the Song I,II,III and Jakhan I,II. The outer boundary of the stream was first digitized on 2010 image and laid over the 2020 image to quantify the changes occurred during the decade of activity. The changes were evaluated in terms of the channel width, Plan form and channel migration. Since no monitoring gauging structures are available the hydrologic change cannot be quantified. All the stream were studied for the above parameter and presented in subsequent sections.

1. Channel width

It has been observed that the active stream width have been reduced in the over the decadal period under study in song I similar trend was also observed in the song II and song III except in lower reaches where the stream width has increased 10-30 percent. This indicate that the leaving 25 per cent of width from the total width have been helpful in training the stream to middle and protecting the fringe areas between the main course and banks. Similar trends were also observed in the Jakhan where the width had reduced over time indicating the confinement of flow to the middle of the stream

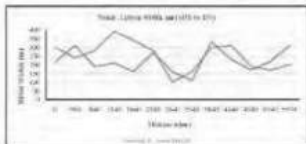
River width of Song I for the year 2010 and 2019-20

Distance (m) (US to DS)	Song I river width (m)	
	2019-20	2010
0	130	100
500	480	440
1000	580	670
1500	580	630
2000	360	530
2500	460	740
3000	410	710
3500	330	540
4000	390	510
4500	310	590
5000	190	540
5580	260	280



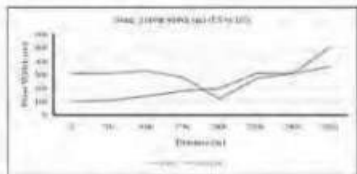
river width of Song II for the year 2008 and 2009 20

Distance (m), (C15 to D10)	Song II river width (m)	
	2009 20	2008
0	230	320
500	110	540
840	190	280
1340	210	190
1840	160	540
2340	270	290
2840	160	120
3340	110	160
3840	140	320
4340	240	110
4840	170	190
5340	220	170
5840	110	200



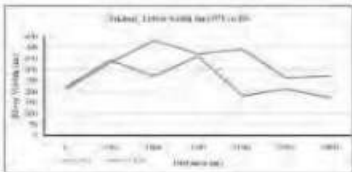
Draw graphs of Song 12 for the year 2010 and 2015-20

Distance (m), (0 to 100)	Song 12 (river width (m))	
	2010-20	2015
0	130	210
20	130	210
40	130	210
60	130	210
80	130	210
100	205	120
120	210	120
140	210	210
160	210	210



Draw graphs of Salton 1 for the year 2010 and 2015-20

Distance (m), (0 to 100)	Salton 1 (river width (m))	
	2010-20	2015
0	230	210
20	230	210
40	230	210
60	230	210
80	230	210
100	230	210
120	230	210
140	230	210
160	230	210



Shrub volume at Indian 12 for the year 2017 and 2021 is:

Distance (m) of 12 to 12B	Tribal, Little Water (m³)	
	2017-2021	2021
0	135	107
500	160	110
1000	180	190
1500	170	175
2000	150	220
2500	140	170
3000	130	220
3500	150	150
4000	100	110
4500	110	130
5000	120	140

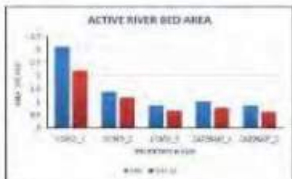
* Shrub volume was given in Imperial units and converted to SI units.

2. Plant Area

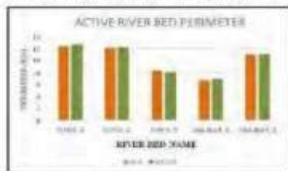
The stream plan form of the Allard stream under the study area has been digitized for both the time series and have been presented in the figure. The plan form of the stream has not changed much over time having same vegetation at the channel banks. This might have resulted from the stream restoration at KHM from the middle area of the stream. This can be explained by prevailing wind & river training work. The vegetation has also been quantified and presented in following manner.

A. Active channel bed and perimeter

Data has been observed in stream at the point but after the study that the perimeter of the bed for extraction remained the same but the area has decreased to some extent over time. This is due to regeneration of vegetation in the stream 25 per cent of area which will help in protecting the bank from erosion.



Active river bed area for all the river stretch for the year 2019 and 2020



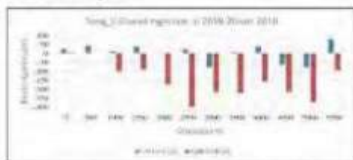
Active river bed perimeter for all the river stretch for the year 2019 and 2020

Active area and perimeter distribution of river stretch

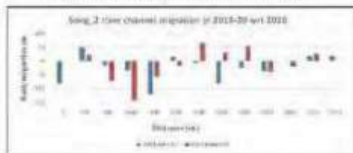
RIVER NAME	YEAR			
	2019 AREA (SQ.M)	2020 AREA (SQ.M)	2019 PERIMETER (M)	2020 PERIMETER (M)
SONG_1	135	115	9.5	9.5
SONG_2	100	95	9.2	9.2
SONG_3	75	65	7.5	7.5
JACHAN_1	85	75	6.5	6.5
JACHAN_2	80	70	9.0	9.0

4. Channel migration

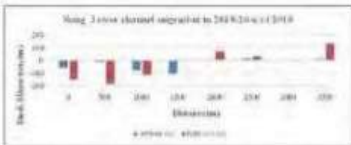
It has been observed on using the plan form that there is some migration of the banks of the reaches of the stream bed under study. The migration of the left and right banks have been quantified and presented in figure. For this Seng 1,2,3,4 and 5 having 1 and 2 negative value indicate the shift towards left side and positive indicated the towards right side. As the stream width has decreased over time the migration is because of aggradation and incision extraction of silt and which can be applied.



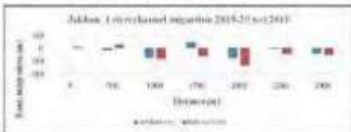
Change in river width of Seng 1 during the year 2015-20 w.r.t 2010



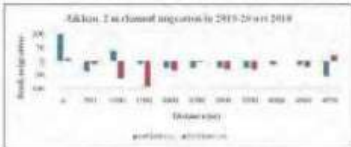
Changes in river Seng 2 during the year 2015-20 w.r.t 2010



Changes in river Song_3 during the year 2019/20 w.r.t 2018



Changes in river of Jokhan_1 during the year 2019/20 w.r.t 2018



Changes in river of Jokhan_2 during the year 2019/20 w.r.t 2018

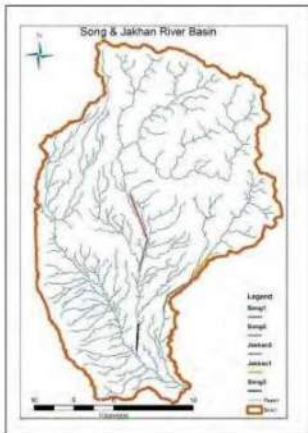


Fig. 2: Watershed map of the rivers Song and Jakhan and different color line within the watershed shows the segments of rivers i.e. Song I, II & III and Jakhan I & II

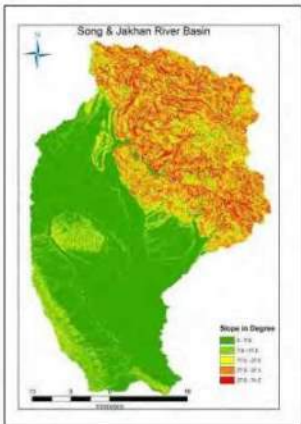


Fig. 3. Slope map of the rivers Song and Jakhan in degree

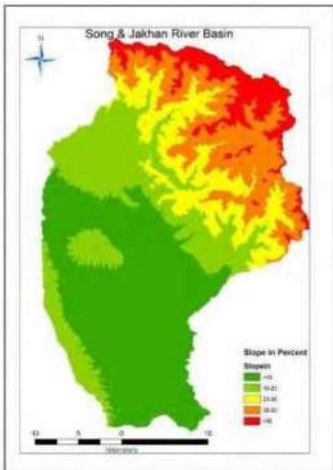
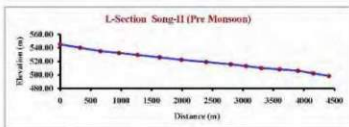
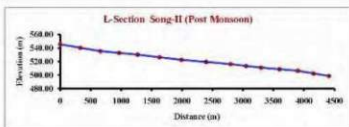
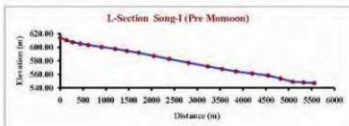
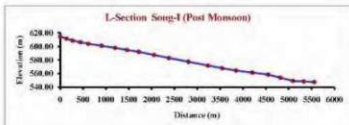
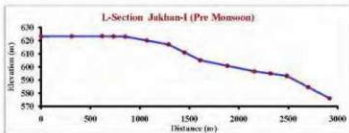
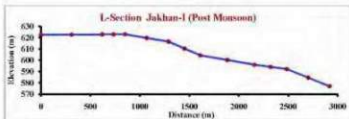
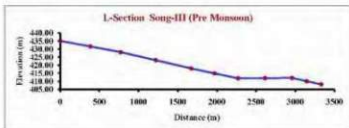
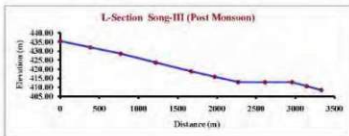


Fig. 4: Slope map of the rivers Song and Jakhan in percent





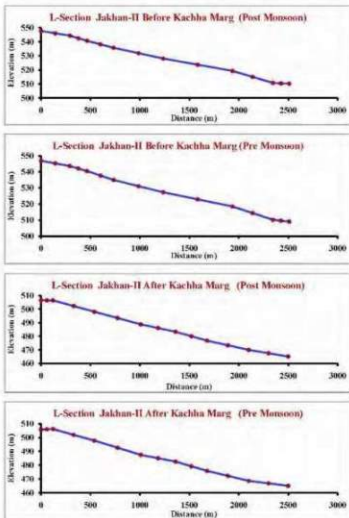


Fig. 5: Pre and post monsoon survey of River Song I, II, II and Jakhan I, II

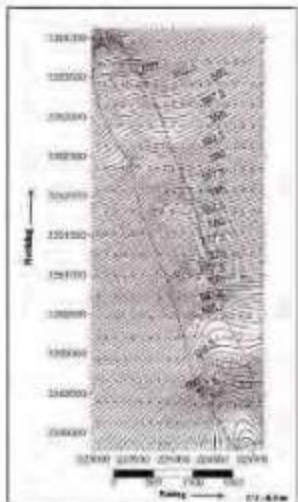


Figure 1: Cross-section of Hill (Scale: 1:100000)

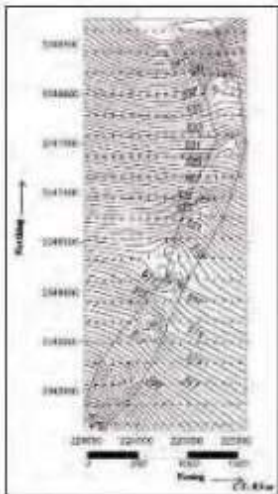


Plate 1. Census Tract 10th Census Tract at River Road

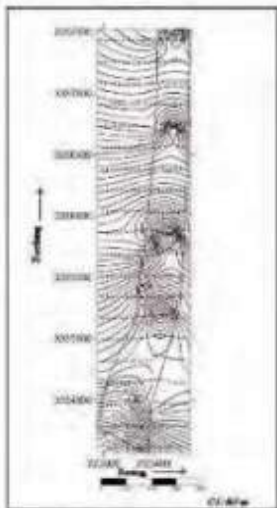
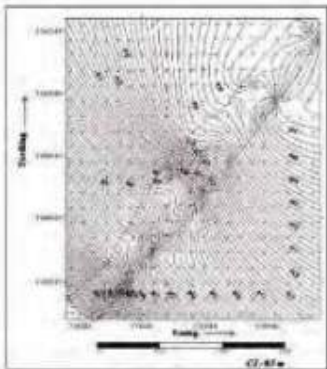


Fig. 1. Section B-C of Vertical Map of Electric Field, 1900.



Topographic Map of the Region of the River John

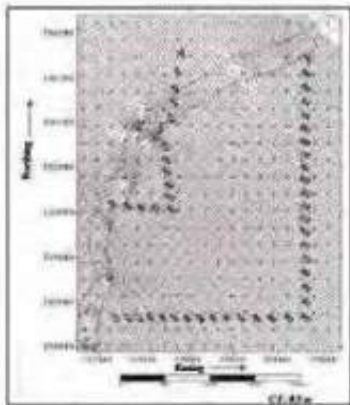


Fig. 1. Map of Fort Valley area, showing topographic contours.

Table 1: Location and relative elevation of various cross- sections in river Song I UTM Zone 48R)

Cross Section 1

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3354079.92	222970.88	616.69	3354080.00	222971.00	616.69
3354081.72	222977.07	616.21	3354082.00	222977.00	616.15
3354084.70	222982.02	615.40	3354084.00	222982.00	615.44
3354087.00	222989.08	615.18	3354087.00	222989.00	615.22
3354088.39	222994.88	615.04	3354088.00	222995.00	615.04
3354090.04	223001.18	614.75	3354090.00	223001.00	614.89
3354092.20	223006.81	614.31	3354092.00	223007.00	614.57
3354094.59	223012.81	613.94	3354094.00	223013.00	614.36
3354094.22	223019.42	613.74	3354095.00	223019.00	614.18
3354096.32	223023.91	613.40	3354097.00	223024.00	614.11
3354098.43	223029.00	613.69	3354098.00	223029.00	614.52
3354099.32	223037.15	614.03	3354100.00	223037.00	614.73
3354102.79	223043.10	614.52	3354102.00	223043.00	614.67
3354103.03	223049.86	614.65	3354103.00	223050.00	614.89
3354105.60	223058.16	614.21	3354105.00	223058.00	614.55
3354107.58	223065.89	614.88	3354107.00	223066.00	614.78
3354110.56	223072.95	615.34	3354110.00	223073.00	615.34
3354109.54	223079.17	615.44	3354110.00	223079.00	615.44
3354111.80	223085.07	615.63	3354112.00	223085.00	615.63
3354112.80	223090.16	615.52	3354113.00	223090.00	615.61
3354114.66	223094.85	616.19	3354115.00	223095.00	616.19

Cross Section II

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3353849.33	223006.07	608.67	3353849.32	223006.10	609.74
3353849.29	223009.89	608.00	3353849.38	223009.96	607.98
3353852.47	223024.23	608.53	3353852.65	223024.04	608.47
3353854.79	223034.87	608.44	3353854.76	223034.99	608.27
3353857.79	223051.23	608.51	3353857.69	223051.32	608.33
3353859.21	223059.76	608.65	3353859.24	223059.96	608.45
3353860.93	223073.04	608.76	3353860.74	223072.95	608.94
3353861.71	223081.85	609.03	3353861.77	223081.78	609.23
3353862.71	223089.42	608.89	3353862.85	223089.61	608.88
3353862.47	223103.04	608.19	3353862.33	223103.12	609.09
3353866.17	223111.08	608.48	3353866.01	223110.97	609.14
3353861.93	223137.33	608.38	3353862.07	223137.33	609.15
3353866.10	223157.38	608.46	3353866.21	223157.52	609.16
3353868.44	223195.64	607.46	3353868.51	223195.70	608.66
3353869.63	223219.72	607.91	3353869.47	223219.61	608.51
3353875.99	223254.18	606.70	3353876.00	223254.02	607.61
3353877.65	223280.49	608.50	3353877.58	223280.36	608.53
3353881.61	223298.74	607.57	3353881.56	223298.77	607.64
3353882.40	223314.32	608.63	3353882.20	223314.28	608.47
3353885.62	223334.64	607.19	3353885.50	223334.73	607.32
3353887.75	223351.06	609.41	3353887.61	223351.08	609.59
3353890.17	223373.93	610.33	3353890.21	223374.13	610.25

Cross Section III

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3353518.46	222977.32	604.89	3353518.21	222976.70	604.79
3353524.22	223023.22	604.20	3353523.93	223023.67	604.12
3353527.42	223055.02	603.70	3353526.70	223054.59	603.80
3353529.00	223082.28	604.21	3353528.41	223082.54	604.06
3353532.46	223119.51	604.49	3353532.47	223119.02	603.93
3353536.82	223145.53	604.41	3353536.48	223145.38	603.97
3353537.54	223170.56	604.51	3353538.30	223171.04	604.22
3353540.28	223206.27	604.46	3353539.73	223206.51	604.08
3353543.35	223234.40	604.42	3353543.11	223234.98	603.76
3353544.95	223264.72	604.07	3353544.21	223265.01	603.35
3353547.80	223294.42	603.72	3353548.29	223293.77	602.96
3353551.08	223325.60	603.76	3353551.65	223326.30	603.26
3353554.60	223348.44	603.78	3353554.42	223349.18	603.58
3353555.08	223374.17	604.03	3353554.58	223374.63	603.77
3353557.58	223401.80	604.04	3353558.30	223401.18	603.55
3353562.40	223438.46	603.82	3353563.06	223439.02	603.98
3353563.05	223464.12	603.37	3353562.71	223464.58	603.29
3353567.39	223500.34	603.53	3353567.57	223500.75	603.63
3353569.38	223527.74	603.02	3353569.39	223527.53	602.87
3353573.14	223548.24	603.35	3353573.04	223547.76	602.49
3353574.81	223564.11	604.84	3353574.79	223563.75	604.84

Cross Section IV

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3353044.61	223829.62	596.98	3353044.95	223829.79	596.98
3353047.97	223821.72	596.98	3353048.37	223821.09	596.88
3353047.41	223801.88	596.78	3353047.65	223802.38	596.53
3353044.58	223784.11	595.92	3353044.37	223782.94	596.17
3353041.61	223762.37	595.69	3353040.99	223762.84	595.81
3353038.76	223747.12	596.21	3353038.47	223745.80	595.96
3353034.88	223725.54	597.22	3353034.76	223726.59	597.47
3353036.72	223706.47	596.99	3353036.79	223706.70	597.11
3353030.28	223679.39	597.01	3353029.55	223680.82	596.76
3353032.36	223668.17	596.94	3353031.67	223667.18	597.19
3353023.89	223650.64	596.86	3353024.33	223651.35	597.26
3353018.70	223633.75	596.92	3353018.47	223632.54	597.36
3353017.11	223621.88	597.06	3353016.59	223622.20	597.46
3353010.41	223605.66	597.29	3353011.03	223605.77	597.56
3353007.60	223575.93	597.32	3353007.80	223575.67	597.67
3353005.56	223556.49	597.45	3353005.08	223555.71	597.57
3353006.68	223532.43	597.28	3353005.89	223531.26	597.67
3353002.40	223513.19	597.62	3353002.11	223513.68	597.71
3353000.29	223480.28	597.62	3352999.55	223480.15	597.88
3352985.65	223457.13	597.49	3352985.94	223456.25	597.78
3352973.01	223417.42	597.32	3352972.49	223418.21	597.68
3352969.58	223360.16	597.29	3352969.28	223359.04	597.58
3352955.51	223295.68	597.02	3352956.11	223295.21	597.17
3352943.57	223224.49	598.01	3352943.12	223223.30	597.96
3352925.43	223132.89	599.05	3352924.92	223133.18	598.91

Cross Section V

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3352410.57	223444.11	594.26	3352410.71	223444.57	594.26
3352422.51	223478.37	592.30	3352422.91	223478.45	592.40
3352438.75	223515.23	591.86	3352438.57	223515.26	591.96
3352446.71	223545.54	592.47	3352447.15	223545.99	592.27
3352459.36	223576.79	592.43	3352459.15	223576.76	592.55
3352470.18	223611.45	592.34	3352470.21	223611.70	592.53
3352481.39	223650.95	592.13	3352481.23	223651.28	592.25
3352491.38	223673.46	591.71	3352491.88	223673.56	591.90
3352499.51	223692.21	591.70	3352499.92	223692.09	592.03
3352505.70	223710.55	591.69	3352505.34	223710.77	591.95
3352509.13	223727.76	591.64	3352509.56	223727.28	591.96
3352517.66	223749.98	591.65	3352517.55	223749.48	591.89
3352523.11	223765.60	591.83	3352522.68	223765.17	592.03
3352528.20	223783.20	591.99	3352528.28	223783.55	592.25
3352537.06	223806.18	592.21	3352537.17	223805.69	592.27
3352542.04	223827.53	592.50	3352542.01	223827.45	592.56
3352551.41	223848.17	592.65	3352551.03	223848.41	592.75
3352560.60	223873.98	592.61	3352560.26	223874.37	592.71
3352568.70	223901.64	592.42	3352568.88	223901.18	592.42
3352578.11	223923.43	592.07	3352577.84	223923.08	592.37
3352583.92	223941.77	593.23	3352583.95	223942.05	593.23
3352593.49	223968.67	593.90	3352593.15	223968.17	593.90

Cross Section VI

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3351986.74	224226.96	585.87	3351987.10	224227.14	585.24
3351964.92	224169.10	584.93	3351965.10	224169.10	585.24
3351950.31	224133.10	585.23	3351950.41	224133.21	584.44
3351946.93	224120.19	583.36	3351947.47	224120.17	583.39
3351941.03	224105.99	583.21	3351941.50	224106.46	583.61
3351934.75	224090.14	583.09	3351934.24	224089.99	583.55
3351919.84	224062.35	583.35	3351920.26	224062.18	583.58
3351910.09	224032.22	583.58	3351910.41	224032.37	583.76
3351900.13	224008.66	583.05	3351900.20	224007.99	583.42
3351892.79	223992.98	583.51	3351892.40	223992.54	583.87
3351887.60	223978.50	583.50	3351887.33	223977.74	583.82
3351883.36	223963.89	583.68	3351883.27	223963.14	583.88
3351876.72	223941.53	583.33	3351876.84	223941.69	583.49
3351868.35	223924.11	582.73	3351869.13	223923.52	582.93
3351862.95	223910.40	582.92	3351862.35	223911.16	583.19
3351861.16	223893.42	582.94	3351860.84	223892.69	583.32
3351855.53	223879.08	583.17	3351855.42	223879.61	583.64
3351852.73	223864.87	584.25	3351852.42	223865.09	584.50
3351843.95	223848.77	584.47	3351844.04	223848.90	584.56
3351835.01	223825.37	584.56	3351835.04	223824.87	584.56
3351821.08	223784.45	584.03	3351820.75	223784.94	584.03
3351807.16	223747.57	585.74	3351806.53	223747.53	585.43
3351789.27	223705.55	586.11	3351789.25	223704.87	586.11
3351770.86	223652.93	586.27	3351770.21	223653.68	586.27
3351752.73	223613.53	586.31	3351753.21	223613.10	586.31

Cross Section VII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3350941.96	223920.62	574.70	3350941.22	223921.09	574.70
3350950.03	223946.48	574.45	3350950.25	223946.11	574.45
3350965.85	223980.14	574.10	3350965.14	223980.10	574.10
3350979.56	224018.68	573.56	3350980.15	224018.21	573.85
3350988.87	224041.89	573.82	3350989.14	224042.22	573.59
3350991.88	224049.69	572.80	3350992.32	224050.15	572.87
3350999.45	224062.64	573.11	3350999.04	224062.75	573.18
3351013.60	224086.82	573.91	3351014.31	224086.59	573.94
3351018.41	224113.77	572.41	3351018.62	224114.34	572.51
3351031.11	224145.48	571.75	3351031.06	224144.84	571.87
3351047.03	224178.36	571.04	3351046.60	224178.56	571.21
3351060.78	224206.43	571.68	3351061.09	224206.33	571.80
3351071.52	224231.56	571.88	3351071.78	224231.57	572.09
3351081.37	224255.77	572.43	3351081.17	224255.38	572.66
3351081.96	224264.46	572.83	3351081.98	224264.68	573.03
3351086.70	224279.46	572.92	3351086.92	224279.79	573.15
3351094.40	224298.88	572.85	3351094.41	224298.28	572.93
3351100.04	224313.38	572.75	3351100.63	224313.51	572.84
3351112.77	224339.06	572.86	3351112.84	224339.05	572.83
3351120.53	224359.17	572.80	3351119.94	224359.93	572.85
3351123.97	224369.82	573.53	3351123.74	224369.98	573.53
3351147.91	224425.23	573.35	3351147.30	224425.84	573.35
3351162.89	224460.85	574.20	3351162.30	224460.73	574.20

Cross Section VIII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3350382.92	224083.80	566.98	3350382.30	224084.10	566.98
3350402.30	224155.37	566.23	3350402.54	224155.16	566.35
3350417.05	224205.59	565.74	3350416.80	224205.58	565.74
3350416.76	224221.97	565.27	3350417.39	224221.56	565.27
3350425.33	224238.36	565.34	3350426.01	224237.75	565.54
3350431.09	224252.93	565.91	3350431.78	224252.49	565.91
3350435.04	224260.19	563.17	3350435.27	224260.97	563.46
3350435.36	224284.08	563.57	3350435.90	224283.43	563.83
3350442.51	224308.48	563.90	3350443.16	224308.42	564.20
3350447.12	224335.54	563.89	3350446.76	224334.83	564.16
3350460.14	224366.62	563.85	3350459.51	224365.92	564.29
3350467.71	224387.67	564.15	3350468.07	224387.75	564.27
3350475.28	224406.18	563.79	3350474.56	224405.97	563.95
3350483.66	224435.31	563.91	3350483.02	224435.32	564.12
3350492.00	224465.20	563.67	3350491.42	224465.09	564.01
3350497.92	224493.99	563.53	3350498.70	224493.47	563.99
3350507.99	224528.19	563.60	3350507.56	224528.11	563.67
3350515.05	224541.96	563.86	3350514.65	224541.72	563.88
3350520.77	224558.70	564.02	3350521.51	224558.47	564.04
3350531.76	224614.06	564.27	3350532.26	224614.43	564.32
3350543.00	224675.75	564.67	3350543.62	224675.82	564.65

Cross Section IX

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3349902.93	224928.78	560.96	3349902.97	224929.10	560.96
3349883.91	224869.73	560.67	3349883.97	224869.71	560.77
3349876.26	224845.24	560.57	3349876.48	224844.64	560.70
3349865.53	224811.01	560.21	3349865.33	224810.76	560.11
3349846.83	224758.20	559.21	3349847.11	224758.04	559.49
3349840.02	224718.21	559.55	3349840.16	224718.83	560.03
3349828.75	224697.58	559.00	3349828.70	224697.24	559.62
3349821.48	224670.24	559.18	3349821.50	224670.22	559.73
3349814.44	224642.12	559.14	3349814.75	224641.59	560.04
3349803.48	224616.09	558.63	3349803.72	224616.40	559.20
3349794.07	224586.38	558.26	3349794.35	224585.92	558.50
3349787.86	224561.52	558.00	3349787.55	224560.95	558.39
3349776.86	224542.36	558.20	3349776.70	224542.61	558.63
3349771.25	224512.69	558.54	3349771.53	224512.62	558.94
3349761.55	224485.11	558.47	3349761.65	224484.51	558.78
3349752.04	224455.86	558.26	3349752.08	224456.51	558.51
3349748.55	224434.56	558.37	3349748.29	224434.00	558.64
3349733.12	224394.78	559.39	3349733.21	224394.97	559.32
3349724.02	224362.35	560.37	3349724.09	224362.53	560.30
3349709.58	224319.13	561.05	3349709.41	224319.26	560.95
3349693.83	224264.23	561.25	3349694.10	224264.10	561.25

Cross Section X

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3349384.95	225087.17	551.64	3349384.20	225087.13	551.69
3349376.26	225058.94	552.02	3349376.26	225059.24	551.98
3349368.21	225035.47	551.44	3349368.25	225035.09	551.80
3349363.90	225017.85	552.04	3349364.55	225017.25	551.73
3349356.43	224991.48	551.14	3349357.15	224992.12	551.15
3349352.13	224974.61	550.83	3349352.27	224975.23	550.54
3349346.95	224957.78	550.25	3349346.26	224957.23	550.08
3349342.22	224940.30	549.65	3349342.17	224939.52	549.85
3349333.08	224908.90	549.34	3349333.34	224908.12	549.56
3349327.48	224888.52	548.77	3349327.16	224888.25	549.13
3349319.58	224857.08	548.89	3349319.25	224857.61	548.99
3349310.12	224829.09	549.03	3349310.25	224829.21	549.12
3349299.54	224789.27	549.10	3349300.15	224788.51	550.00
3349288.47	224753.78	549.41	3349289.26	224754.21	549.70
3349280.93	224725.38	549.33	3349280.21	224725.31	549.57
3349271.81	224695.67	549.75	3349271.99	224695.25	549.84
3349264.21	224664.67	550.31	3349264.41	224665.37	550.37
3349251.67	224619.39	549.88	3349251.36	224620.13	549.94
3349238.62	224576.50	550.75	3349238.36	224576.20	550.59
3349223.94	224523.38	551.42	3349224.31	224524.22	551.34

Cross Section XI

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3348796.91	224780.98	549.25	3348797.22	224781.10	549.25
3348804.15	224801.63	548.59	3348804.11	224801.25	548.65
3348807.64	224818.60	547.95	3348807.99	224818.56	547.99
3348814.57	224837.61	547.63	3348814.53	224837.21	547.55
3348817.11	224847.29	547.56	3348817.25	224847.35	547.41
3348821.23	224859.82	546.81	3348821.15	224860.21	547.10
3348823.49	224872.38	546.61	3348823.73	224872.21	546.91
3348829.64	224889.28	545.97	3348829.77	224889.05	546.48
3348835.60	224905.57	546.48	3348835.28	224905.49	547.10
3348840.00	224923.42	546.50	3348840.29	224923.37	547.00
3348846.31	224937.98	546.46	3348845.98	224938.35	546.84
3348848.38	224954.97	546.95	3348848.75	224954.92	547.53
3348855.14	224976.42	547.03	3348854.94	224976.30	547.34
3348859.72	224992.40	546.81	3348859.37	224992.14	547.39
3348865.78	225010.90	546.85	3348866.09	225011.00	547.26
3348871.06	225026.91	547.21	3348871.27	225026.98	547.48
3348876.96	225046.58	547.43	3348876.64	225046.43	547.47
3348880.51	225065.88	547.48	3348880.85	225065.59	547.35
3348889.16	225086.17	548.42	3348888.86	225085.84	548.26
3348895.18	225107.80	548.42	3348895.25	225108.05	548.35
3348902.10	225131.90	548.75	3348902.25	225132.15	548.85

Table 2: Distance and depth of extraction (Song 1)

Distance	CS1	32.21	37.95	44.27	50.29	55.66	60.73	68.96	75.29	82.28	90.52	98.63						64.43
Depth		0.16	0.25	0.42	0.43	0.71	0.83	0.70	0.14	0.24	0.34	0.09						0.39
Distance	CS2	92.57	97.88	106.19	111.84	152.35	190.57	214.46	249.35	275.71	277.72							185.15
Depth		0.54	0.90	0.65	0.78	0.71	1.20	0.50	0.91	0.03	0.04							0.64
Distance	CS3	147.37	169.71	194.18	229.99	258.29	288.63	318.46	349.81	372.88	398.54	426.28	442.12					294.75
Depth		0.54	0.44	0.30	0.38	0.65	0.72	0.76	0.50	0.20	0.26	0.49	0.21					0.45
Distance	CS4	176.72	179.62	199.02	209.52	228.57	258.82	276.96	301.07	319.00	352.57	378.18	417.91	476.79	530.15			353.44
Depth		0.37	0.39	0.44	0.40	0.27	0.35	0.12	0.39	0.15	0.26	0.28	0.36	0.29	0.18			0.31
Distance	CS5	138.62	140.79	177.40	218.41	242.95	263.11	282.52	299.50	323.09	339.59	358.79	382.63	404.77	415.85			277.24
Depth		0.10	0.12	0.19	0.12	0.19	0.33	0.26	0.32	0.24	0.19	0.26	0.06	0.07	0.08			0.18
Distance	CS6	164.27	177.99	209.32	235.74	252.99	268.61	283.58	306.00	325.73	339.71	357.48	371.64	386.28	404.19			240.12
Depth		0.32	0.23	0.18	0.37	0.38	0.33	0.20	0.15	0.20	0.27	0.38	0.47	0.25	0.09			0.27
Distance	CS7	145.79	153.00	180.92	208.18	241.11	278.21	309.40	336.82	362.41	371.30	387.16	407.11	423.56	437.38			291.59
Depth		0.07	0.07	0.03	0.10	0.12	0.16	0.12	0.21	0.23	0.21	0.23	0.08	0.10	0.03			0.13
Distance	CS8	153.33	159.74	175.51	184.63	208.41	232.47	258.88	292.31	315.52	334.83	365.37	396.31	435.59	459.9844			306.6563
Depth		0.08	0.20	0.50	0.28	0.25	0.29	0.27	0.45	0.12	0.16	0.20	0.33	0.45	0.096409			0.2644021
Distance	CS9	174.26	179.94	219.45	243.47	271.40	300.73	328.07	359.98	385.82	406.59	436.73	468.51	496.09	518.70	522.77		348.52
Depth		0.25	0.28	0.48	0.62	0.54	0.90	0.57	0.24	0.39	0.43	0.40	0.32	0.25	0.27	0.54		0.44
Distance	CS10	148.29	153.47	186.09	206.90	238.53	268.31	310.22	346.19	376.48	407.63	438.44	438.88					292.59
Depth		0.05	0.20	0.23	0.36	0.10	0.09	0.90	0.28	0.25	0.09	0.06	0.06					0.22
Distance	CS11	87.76	91.14	107.98	124.43	142.29	157.27	173.83	195.21	211.05	229.91	245.88	263.29					175.53
Depth		0.30	0.30	0.51	0.62	0.50	0.38	0.58	0.31	0.57	0.41	0.27	0.06					0.40

Table 3: Volume of safely extractable RBM from River Song I

Location	Length Segment (m)	Width of the river (m)	Extractable width (m)	Average Depth of Extraction	Cross Section (m ²)	Average Cross section (m ²)	Volume (m ³)	Cumulative Volume (m ³)
CS1	0	128.34	64.42	0.39	25.34	0	0	0
CS2	270	370.29	185.15	0.64	117.59	71.47	19296.60	19296.60
CS3	340	589.49	294.75	0.45	132.64	125.12	42539.18	61835.78
CS4	590	706.87	353.44	0.31	109.56	121.10	71449.18	133284.96
CS5	520	554.47	277.24	0.18	49.90	79.73	41461.72	174746.68
CS6	660	657.07	240.12	0.27	64.83	57.37	37862.56	212609.23
CS7	850	583.18	291.59	0.13	37.91	51.37	43663.77	256273.00
CS8	620	613.31	306.66	0.22	67.46	52.69	32664.96	288937.96
CS9	700	697.03	348.52	0.44	153.35	110.41	77283.92	366221.88
CS10	540	585.18	292.59	0.22	64.37	100.86	58783.49	425005.37
CS11	470	351.05	175.53	0.40	70.21	111.78	52535.98	477541.35
						Total Volume		477541.35
Recommended volume of extraction (90% of total volume)								429787.21

Table 1: Location and relative elevation of various cross- sections in river Song II (UTM Zone 44R)

Cross Section I

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3348680.34	224850.52	547.85	3348680.25	224850.25	547.85
3348686.23	224871.26	547.38	3348686.04	224871.64	547.42
3348685.81	224872.13	546.50	3348686.21	224872.33	546.55
3348687.65	224887.17	545.49	3348688.08	224887.35	545.57
3348689.11	224894.97	546.00	3348689.02	224895.28	546.05
3348691.31	224918.56	545.36	3348690.89	224918.09	545.46
3348690.08	224939.64	545.76	3348690.28	224939.33	545.77
3348700.79	224962.50	544.95	3348700.68	224962.42	545.14
3348704.93	224978.95	544.85	3348704.72	224979.21	545.82
3348706.81	225000.18	544.91	3348706.79	225000.36	545.65
3348709.36	225014.31	545.09	3348709.77	225014.02	545.81
3348709.01	225026.72	545.04	3348709.18	225026.59	545.36
3348713.01	225047.35	545.23	3348713.42	225047.74	545.65
3348717.33	225069.80	545.40	3348717.07	225070.16	545.71
3348734.01	225090.36	545.64	3348734.15	225090.34	545.87
3348742.64	225122.75	546.61	3348742.61	225123.08	546.75
3348744.86	225132.95	547.18	3348744.54	225132.75	547.04
3348746.71	225156.26	545.97	3348746.71	225155.80	546.57
3348748.28	225178.29	547.30	3348748.30	225178.24	546.98
3348756.00	225211.18	547.28	3348756.21	225211.30	547.31

Cross Section II

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3348067.02	225156.04	537.27	3348067.15	225156.12	537.27
3348069.54	225161.47	536.69	3348069.13	225161.13	536.67
3348072.46	225177.26	536.16	3348072.95	225177.69	536.22
3348082.99	225203.85	535.40	3348083.31	225203.59	535.47
3348091.14	225221.68	535.09	3348091.59	225222.09	535.10
3348095.85	225240.61	535.10	3348096.18	225240.77	535.24
3348103.10	225259.24	534.36	3348103.32	225258.78	534.67
3348109.09	225278.66	534.44	3348108.85	225278.92	535.29
3348117.41	225303.17	534.55	3348117.47	225302.84	534.82
3348124.08	225322.37	535.01	3348124.33	225322.51	535.30
3348137.68	225359.10	535.06	3348138.09	225358.70	535.34
3348142.50	225372.07	534.46	3348142.13	225371.72	534.64
3348130.98	225387.29	535.79	3348130.62	225387.69	535.79
3348147.45	225384.46	534.33	3348147.36	225384.49	534.35
3348151.69	225397.18	534.27	3348151.25	225397.15	534.65
3348154.31	225411.38	535.33	3348154.07	225411.26	535.46
3348160.29	225424.16	534.90	3348160.25	225424.10	534.99
3348165.96	225442.12	535.75	3348165.99	225442.13	535.86
3348174.38	225463.51	536.58	3348174.26	225463.25	536.62
3348183.31	225491.87	536.49	3348182.93	225492.14	536.43

Cross Section III

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3347554.08	225317.88	531.90	3347553.84	225317.86	531.90
3347551.99	225333.61	531.62	3347551.68	225333.25	531.57
3347550.08	225347.32	530.85	3347549.64	225347.00	531.51
3347548.54	225355.56	530.68	3347548.29	225355.98	531.31
3347546.92	225366.09	531.03	3347547.23	225366.15	531.23
3347545.25	225377.49	531.45	3347545.15	225377.29	531.01
3347543.11	225387.38	530.88	3347542.85	225387.12	530.69
3347540.69	225395.87	531.42	3347540.67	225396.17	530.91
3347538.49	225407.59	530.17	3347538.88	225407.18	530.33
3347539.41	225420.28	530.71	3347539.39	225419.93	530.15
3347538.42	225430.98	530.53	3347538.61	225431.07	530.59
3347535.82	225444.09	529.71	3347536.22	225443.92	530.62
3347534.75	225453.04	529.48	3347534.58	225452.72	530.04
3347536.10	225461.57	529.43	3347535.64	225461.32	530.10
3347532.93	225469.29	529.43	3347532.51	225468.85	530.02
3347532.01	225474.29	529.34	3347531.87	225474.57	529.79
3347529.47	225488.08	529.89	3347529.37	225488.52	530.07
3347528.34	225497.26	530.35	3347528.30	225497.65	530.73
3347527.22	225505.66	530.73	3347527.63	225505.77	530.91
3347523.77	225517.09	530.86	3347524.23	225516.84	531.06
3347519.59	225524.87	531.26	3347519.82	225525.13	531.34
3347519.76	225545.81	531.05	3347519.86	225545.58	531.02
3347516.11	225564.70	531.89	3347516.20	225565.10	531.99
3347511.92	225592.50	532.28	3347512.23	225592.20	532.21

Cross Section IV

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3346942.60	225063.24	524.92	3346942.24	225063.36	524.92
3346937.85	225088.84	524.60	3346937.89	225088.73	524.78
3346926.57	225110.89	524.47	3346926.62	225110.63	524.59
3346918.70	225121.42	523.46	3346918.21	225121.26	523.54
3346912.13	225137.26	522.57	3346911.65	225137.28	522.66
3346902.36	225147.02	522.42	3346902.54	225147.43	522.54
3346897.98	225156.80	522.82	3346897.72	225156.38	522.96
3346893.10	225164.73	522.58	3346892.63	225164.48	522.94
3346887.09	225172.74	522.67	3346887.32	225173.12	522.86
3346883.63	225181.02	522.43	3346883.43	225181.21	522.68
3346872.78	225201.86	522.17	3346872.65	225201.95	522.41
3346867.71	225213.22	522.17	3346867.70	225212.78	522.61
3346859.32	225220.92	522.18	3346859.70	225221.14	522.89
3346848.52	225232.10	522.23	3346848.33	225232.57	522.62
3346848.98	225244.27	522.33	3346848.62	225243.85	522.75
3346844.41	225252.28	522.34	3346844.17	225251.90	522.86
3346839.24	225261.98	522.46	3346839.05	225262.21	522.70
3346830.37	225275.61	522.80	3346830.43	225275.17	522.93
3346826.19	225283.10	523.17	3346826.51	225283.31	523.29
3346818.33	225298.49	523.27	3346818.54	225298.78	523.39
3346806.46	225324.38	523.37	3346806.66	225324.19	523.76
3346793.73	225345.75	523.75	3346794.00	225346.16	523.83
3346785.07	225360.56	524.02	3346785.12	225360.10	524.02

Cross Section V

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3346167.30	224785.39	518.74	3346167.32	224785.16	518.74
3346164.18	224792.33	518.55	3346164.36	224792.15	518.55
3346158.46	224798.40	518.28	3346158.26	224798.69	518.34
3346154.94	224808.32	516.92	3346154.62	224807.88	517.02
3346146.67	224819.80	516.86	3346146.22	224820.27	516.83
3346140.16	224835.51	517.03	3346140.14	224835.41	517.13
3346131.22	224850.87	516.08	3346130.83	224851.22	516.41
3346126.55	224857.73	515.89	3346126.18	224857.57	516.42
3346122.93	224863.67	515.85	3346123.11	224863.36	516.47
3346119.38	224868.72	515.70	3346119.51	224868.91	516.34
3346116.29	224876.69	515.43	3346116.25	224876.26	516.05
3346111.56	224883.34	515.61	3346111.41	224883.76	516.03
3346102.22	224896.97	515.62	3346102.15	224896.80	516.07
3346097.52	224906.71	515.09	3346097.58	224906.50	515.83
3346092.11	224916.04	514.88	3346092.17	224915.65	515.35
3346087.59	224921.34	514.27	3346087.45	224921.75	514.96
3346084.30	224931.71	515.76	3346084.00	224931.50	515.76
3346077.97	224940.27	516.19	3346078.30	224939.91	516.17
3346075.78	224946.52	517.60	3346075.69	224946.91	517.60
3346433.99	224841.87	516.96	3346434.21	224842.21	516.99

Cross Section VI

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3345681.78	224608.36	513.35	3345681.21	224608.59	513.35
3345678.63	224613.31	512.86	3345678.21	224613.65	512.75
3345673.87	224622.60	512.58	3345673.86	224622.12	512.59
3345670.72	224628.93	512.30	3345670.34	224629.32	512.22
3345666.22	224636.43	511.77	3345666.25	224636.98	511.94
3345660.27	224652.87	510.89	3345660.13	224652.25	511.35
3345656.92	224657.53	511.23	3345657.37	224657.49	511.52
3345654.77	224662.99	510.98	3345655.21	224662.49	511.18
3345653.30	224668.23	510.67	3345653.00	224668.22	511.10
3345648.71	224673.08	510.08	3345649.25	224673.15	510.90
3345648.18	224678.27	510.87	3345648.52	224677.96	511.28
3345646.72	224681.16	511.27	3345646.40	224681.40	511.74
3345642.68	224688.04	511.62	3345642.39	224688.38	511.74
3345638.63	224698.51	511.62	3345638.39	224699.12	512.06
3345634.01	224706.77	512.02	3345634.36	224707.32	512.19
3345630.74	224713.97	511.94	3345631.24	224714.25	512.35
3345626.07	224720.78	512.58	3345626.32	224721.33	512.56
3345621.77	224733.43	513.18	3345621.33	224733.10	513.19
3345617.71	224740.61	513.86	3345618.22	224741.07	513.89
3345771.62	224492.87	512.66	3345771.80	224492.89	512.10

Cross Section VII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3345076.25	224516.35	508.17	3345076.39	224516.25	508.17
3345082.06	224498.97	508.16	3345082.14	224498.95	508.16
3345086.63	224476.87	508.17	3345086.78	224477.07	508.17
3345085.61	224469.49	508.18	3345085.85	224469.47	508.16
3345091.89	224460.75	507.55	3345092.15	224460.69	507.69
3345104.66	224448.37	507.52	3345104.68	224448.34	507.55
3345109.81	224437.40	507.32	3345109.73	224437.38	507.46
3345117.04	224421.22	506.88	3345117.34	224421.46	507.16
3345121.76	224407.53	506.34	3345122.07	224407.62	506.66
3345129.11	224391.21	506.06	3345128.81	224391.11	506.26
3345140.35	224370.68	506.01	3345140.11	224370.40	506.53
3345150.21	224346.20	506.53	3345149.91	224346.24	506.91
3345156.42	224334.18	506.13	3345156.34	224334.43	506.33
3345166.08	224316.32	506.05	3345165.75	224316.28	506.09
3345172.59	224299.23	506.26	3345172.61	224299.00	506.80
3345182.49	224278.12	506.68	3345182.67	224278.49	506.91
3345191.73	224255.34	505.80	3345191.94	224255.38	506.38
3345199.11	224237.77	505.71	3345199.26	224237.79	506.04
3345205.23	224225.93	506.75	3345205.24	224225.97	506.75
3345210.28	224216.25	507.12	3345210.09	224216.61	507.12
3345220.57	224195.58	507.49	3345220.49	224195.32	507.50
3345225.19	224184.94	507.86	3345225.09	224184.83	507.84
3345229.61	224170.32	507.84	3345229.91	224170.15	507.57
3345237.05	224158.34	507.01	3345236.86	224158.51	506.83
3345243.80	224143.03	506.29	3345243.87	224142.83	506.29

Cross Section VIII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3344603.84	224149.65	500.75	3344604.22	224150.13	500.75
3344613.64	224144.15	500.53	3344613.79	224144.50	500.67
3344621.01	224137.64	498.59	3344621.14	224137.61	498.83
3344628.73	224131.31	498.01	3344628.56	224131.72	498.24
3344635.16	224120.32	498.03	3344635.23	224120.34	498.10
3344649.64	224110.84	498.55	3344649.51	224110.97	499.05
3344658.17	224105.74	498.47	3344658.34	224105.87	498.81
3344667.18	224099.04	497.53	3344667.44	224098.78	498.64
3344674.89	224089.93	497.96	3344674.62	224090.30	498.22
3344684.75	224085.11	498.15	3344684.83	224085.27	498.95
3344695.60	224074.39	498.09	3344695.72	224074.17	498.36
3344703.71	224069.65	498.23	3344703.75	224069.57	498.53
3344715.80	224058.48	498.32	3344715.33	224058.92	498.56
3344727.38	224047.23	498.35	3344727.80	224047.31	498.47
3344738.39	224040.70	499.56	3344738.23	224041.06	499.56
3344744.96	224037.20	500.38	3344744.57	224037.53	500.38
3344756.76	224031.28	500.67	3344756.46	224030.82	500.67
3344770.20	224022.67	500.43	3344769.99	224022.78	500.43
3344811.68	223994.64	500.75	3344812.07	223994.22	500.77
3344827.53	223978.61	501.13	3344827.13	223979.05	501.13

Table 2: Distance and depth of extraction (Song II)

Distance	CS1	92.24	114.01	131.26	152.44	166.40	178.69	200.25	222.99	246.06	276.71							184.48
Depth		0.03	0.19	0.98	0.75	0.72	0.32	0.42	0.30	0.22	0.15							0.41
Distance	CS2	88.85	89.48	108.84	129.68	155.10	175.94	214.64	228.26	240.10	243.04	255.27	266.56					177.71
Depth		0.14	0.14	0.31	0.85	0.27	0.29	0.28	0.18	0.00	0.01	0.38	0.19					0.25
Distance	CS3	60.77	70.13	79.41	90.57	103.09	114.23	127.29	136.21	144.62	152.49	158.25	172.40	181.60	189.73	201.18	208.11	138.74
Depth		-0.21	-0.20	-0.51	0.16	-0.55	0.06	0.90	0.56	0.67	0.50	0.45	0.18	0.38	0.17	0.20	0.11	0.18
Distance	CS4	83.94	92.98	101.13	112.64	122.74	131.71	155.09	166.98	178.06	193.52	203.33	212.53	224.04	239.51	248.54	251.83	167.89
Depth		0.10	0.12	0.14	0.35	0.19	0.25	0.24	0.44	0.71	0.36	0.42	0.51	0.24	0.13	0.12	0.12	0.28
Distance	CS5	68.23	75.48	83.29	89.83	96.44	104.44	113.85	129.28	139.96	150.59	158.23	168.40					100.17
Depth		0.24	0.34	0.53	0.62	0.64	0.62	0.42	0.45	0.74	0.48	0.68	0.00					0.48
Distance	CS6	36.74	48.48	54.40	59.84	65.96	72.07	76.68	80.70	88.73	100.14	108.78	110.21					73.48
Depth		0.75	0.46	0.29	0.21	0.43	0.81	0.41	0.47	0.12	0.44	0.17	0.20					0.35
Distance	CS7	102.31	103.24	117.84	135.68	150.16	185.23	198.63	219.03	237.61	260.43	285.32	304.36	306.94				201.63
Depth		0.28	0.29	0.32	0.20	0.51	0.38	0.20	0.04	0.53	0.22	0.58	0.32	0.26				0.32
Distance	CS8	55.86	63.62	70.92	80.77	92.17	99.64	111.63	124.13	134.16								78.30
Depth		0.46	1.11	0.26	0.80	0.27	0.30	0.24	0.12	0.00								0.40

Table 3: Volume of safely extractable RHM from River Song II

Location	Length Segment (m)	Width of the river (m)	Extraction-able width (m)	Average Depth of Extraction	Cross Section (m ²)	Average Cross-section (m ²)	Volume (m ³)	Cumulative Volume (m ³)
CS1	0	368.9507	184.48	0.41	75.50	0	0	0
CS2	600	355.4138	177.71	0.25	45.13	60.23	39738.59	39738.59
CS3	610	277.48	138.74	0.18	25.60	35.36	21507.58	61246.17
CS4	720	235.77	107.89	0.28	46.89	36.34	26094.95	87341.12
CS5	810	272.92	100.17	0.48	48.04	47.46	58446.18	125847.31
CS6	500	146.9518	73.48	0.35	26.04	37.04	18520.38	144367.69
CS7	600	409.2598	204.63	0.37	65.24	45.64	27383.49	171751.18
CS8	510	223.4258	78.30	0.40	31.00	48.12	24541.42	196292.60
Total Volume							196292.60	
Recommended volume of extraction (90% of total volume)							176663.34	

Table 1: Location and relative elevation of various cross- sections in river Song III (UTM Zone 44R)

Cross Section I

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3337478.76	223442.66	440.12	3337479.25	223443.16	440.12
3337478.37	223458.69	439.93	3337478.53	223459.04	440.03
3337479.83	223471.95	436.46	3337479.54	223472.45	436.37
3337480.63	223485.07	435.73	3337480.71	223485.11	435.67
3337479.50	223494.67	435.67	3337479.98	223495.13	435.61
3337481.75	223506.40	436.55	3337481.37	223505.98	436.68
3337481.41	223518.71	437.08	3337481.37	223518.43	437.14
3337481.85	223530.33	437.33	3337482.10	223530.16	437.49
3337482.57	223539.48	437.51	3337482.45	223539.38	437.64
3337482.58	223546.38	437.64	3337482.44	223546.69	437.84
3337482.75	223554.84	438.38	3337482.58	223555.13	438.40
3337483.55	223567.58	435.06	3337483.62	223567.66	435.50
3337483.20	223573.19	434.97	3337483.02	223573.47	435.66
3337483.18	223582.39	434.41	3337482.85	223581.96	435.29
3337483.52	223589.40	434.46	3337483.15	223589.39	435.80
3337483.59	223597.81	434.27	3337483.48	223598.30	435.20
3337483.76	223609.45	435.01	3337484.24	223609.14	435.18
3337484.61	223622.45	436.36	3337485.07	223622.18	436.53
3337484.11	223632.77	437.29	3337484.38	223632.86	437.33
3337485.33	223648.27	438.71	3337485.20	223648.69	438.63
3337485.18	223665.42	439.57	3337485.20	223665.25	439.56
3337521.69	223687.48	440.07	3337522.07	223687.13	440.17

Cross Section II

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3336714.53	223402.87	433.50	3336714.52	223402.89	433.50
3336704.51	223433.91	432.96	3336704.39	223433.94	432.99
3336709.56	223457.02	433.42	3336709.65	223456.94	433.34
3336709.57	223471.31	433.14	3336709.52	223471.22	433.66
3336708.15	223479.95	430.02	3336708.24	223479.88	430.51
3336707.87	223485.52	430.55	3336707.96	223485.53	430.75
3336708.24	223492.18	427.92	3336708.26	223492.29	428.59
3336708.30	223500.15	428.05	3336708.42	223500.24	428.86
3336708.58	223507.51	428.83	3336708.59	223507.61	428.98
3336707.14	223517.68	428.56	3336707.21	223517.78	429.19
3336707.08	223528.35	428.15	3336707.13	223528.34	428.57
3336706.53	223536.25	427.95	3336706.44	223536.16	428.79
3336706.09	223545.52	428.09	3336706.01	223545.56	428.71
3336706.38	223565.75	426.58	3336706.35	223565.71	426.74
3336706.09	223574.89	428.61	3336706.76	223574.98	428.83
3336705.56	223582.14	428.45	3336705.56	223582.22	429.20
3336705.49	223592.07	428.20	3336705.39	223592.15	428.84
3336705.51	223602.42	429.69	3336705.59	223602.46	429.79
3336704.44	223614.55	430.74	3336704.37	223614.66	430.78
3336704.38	223623.03	433.26	3336704.42	223623.10	433.39
3336704.20	223632.16	433.08	3336704.17	223632.08	433.13
3336703.36	223650.59	433.29	3336703.24	223650.54	433.39

Cross Section III

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3335761.16	223324.11	425.22	3335761.21	223324.16	425.22
3335770.61	223359.24	425.02	3335770.55	223359.26	425.10
3335770.92	223379.32	425.04	3335770.95	223379.49	424.93
3335773.27	223385.64	424.00	3335773.16	223385.69	423.81
3335776.84	223399.37	423.42	3335776.95	223399.36	423.59
3335780.10	223405.78	419.95	3335780.06	223405.77	420.17
3335783.47	223416.04	419.98	3335783.52	223416.03	420.48
3335786.95	223427.00	419.53	3335787.03	223427.06	420.12
3335790.08	223441.65	419.16	3335790.15	223441.68	420.24
3335798.94	223452.16	418.45	3335799.02	223452.14	419.40
3335806.25	223473.65	418.00	3335806.29	223473.72	418.78
3335810.34	223489.49	417.75	3335810.44	223489.48	418.89
3335812.20	223509.36	417.18	3335812.22	223509.33	418.07
3335814.05	223520.48	417.01	3335813.96	223520.46	417.97
3335817.73	223532.24	417.39	3335817.73	223532.25	417.87
3335823.61	223547.19	418.30	3335823.56	223547.27	418.31
3335830.76	223560.89	418.03	3335830.83	223560.84	418.02
3335834.93	223570.25	417.47	3335835.02	223570.30	417.59
3335839.92	223583.07	420.15	3335839.81	223583.05	420.19
3335842.14	223594.54	421.76	3335842.03	223594.47	421.80
3335841.03	223608.25	424.32	3335841.08	223608.18	424.34
3335840.79	223617.87	424.76	3335840.69	223617.79	424.76

Cross Section IV

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3335174.79	223269.31	417.47	3335175.02	223269.64	417.50
3335177.70	223281.58	416.41	3335177.22	223281.90	416.49
3335179.53	223298.85	417.16	3335179.40	223298.68	417.10
3335181.71	223309.88	416.99	3335181.29	223309.89	417.01
3335183.87	223332.22	415.57	3335184.28	223332.29	415.51
3335185.55	223342.65	415.60	3335185.68	223342.29	415.64
3335188.97	223367.12	414.69	3335189.32	223367.19	414.78
3335189.00	223383.95	413.78	3335188.84	223383.82	413.86
3335191.94	223395.43	411.05	3335191.53	223395.52	412.16
3335181.86	223403.15	411.06	3335181.38	223403.19	412.54
3335184.05	223408.61	411.13	3335183.72	223409.01	412.44
3335185.48	223422.76	411.38	3335185.44	223423.00	412.58
3335185.80	223436.13	411.85	3335185.63	223435.89	412.88
3335189.55	223450.04	411.88	3335190.01	223449.56	412.56
3335191.69	223458.95	412.18	3335191.29	223459.24	412.73
3335195.65	223472.99	412.35	3335196.06	223472.52	412.39
3335200.78	223485.26	413.46	3335200.93	223485.30	413.55
3335204.79	223498.10	413.25	3335205.03	223497.83	413.31
3335210.03	223507.61	414.22	3335210.16	223507.57	414.39
3335218.58	223538.32	414.46	3335218.49	223538.28	414.51
3335216.70	223548.54	416.40	3335216.54	223548.10	416.47
3335217.19	223572.04	417.94	3335217.21	223572.29	417.97
3335219.54	223580.83	417.86	3335219.62	223580.64	417.82

Cross Section V

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3334657.96	223030.89	415.58	3334658.00	223031.24	415.58
3334644.62	223039.23	415.10	3334644.74	223039.50	415.04
3334635.67	223045.32	415.30	3334635.82	223045.08	415.25
3334626.10	223054.72	413.55	3334625.70	223054.65	413.57
3334617.76	223062.22	413.77	3334617.38	223062.44	413.87
3334609.38	223069.54	413.89	3334609.60	223069.85	413.96
3334602.73	223083.03	413.90	3334602.55	223082.59	414.02
3334596.78	223092.05	414.03	3334596.90	223092.37	414.04
3334589.86	223104.03	413.27	3334589.45	223103.77	413.60
3334585.34	223146.89	412.79	3334585.73	223146.91	413.54
3334552.80	223167.91	412.12	3334552.70	223167.70	412.75
3334545.14	223178.62	412.20	3334545.15	223178.32	413.21
3334546.26	223178.64	412.21	3334546.09	223179.11	413.08
3334528.95	223207.21	411.99	3334528.67	223207.18	412.71
3334522.36	223214.38	412.48	3334522.37	223214.65	412.31
3334505.49	223246.92	411.88	3334505.79	223247.41	411.93
3334501.72	223257.47	414.40	3334502.04	223257.47	414.46
3334494.05	223266.29	414.83	3334493.72	223266.38	414.87
3334479.22	223288.95	415.22	3334479.13	223288.54	415.25
3334459.64	223314.65	415.47	3334459.33	223315.14	415.56
3334441.50	223345.29	416.16	3334441.29	223345.08	416.15

Cross Section VI

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3334070.56	223327.03	407.30	3334070.32	223326.94	407.30
3334077.65	223312.97	407.57	3334077.45	223312.83	407.63
3334081.03	223288.59	405.53	3334081.11	223288.67	405.60
3334098.58	223257.21	405.84	3334098.79	223257.27	405.95
3334112.94	223229.99	406.98	3334113.24	223230.48	407.22
3334123.70	223211.48	406.57	3334123.31	223211.13	406.89
3334137.05	223189.87	406.34	3334137.26	223189.51	406.60
3334152.36	223168.87	406.86	3334151.96	223169.32	407.08
3334166.15	223154.41	407.04	3334166.21	223154.60	408.03
3334170.75	223126.57	408.08	3334170.30	223126.61	408.49
3334177.38	223096.76	407.52	3334177.39	223096.63	408.88
3334189.25	223069.76	406.95	3334189.61	223070.16	408.43
3334212.55	223044.73	407.01	3334212.26	223045.10	407.96
3334211.40	223017.13	408.18	3334211.36	223016.85	408.11
3334222.18	223004.30	409.46	3334222.37	223003.82	409.55
3334231.89	222994.63	408.93	3334231.93	222995.08	409.10
3334243.31	222983.03	409.01	3334243.71	222982.78	409.04
3334256.92	222966.81	409.00	3334256.60	222966.97	409.00
3334267.53	222954.56	408.61	3334268.03	222954.42	408.72
3334272.61	222950.35	409.62	3334272.73	222949.94	409.77
3334279.95	222945.10	409.96	3334279.89	222945.38	409.88

Table 2: Distance and depth of extraction (Song III)

Distance	CS1	124.58	120.37	138.85	146.28	155.20	166.06	179.11	185.78								61.20
Depth		0.44	0.69	0.88	1.34	0.93	0.17	0.17	0.09								0.59
Distance	CS2	61.98	68.52	77.24	82.91	89.62	97.54	104.89	115.12	125.67	133.52	142.93	163.02	172.26	179.55	185.93	123.95
Depth		0.25	0.52	0.49	0.20	0.67	0.83	0.16	0.63	0.41	0.84	0.63	0.16	0.21	0.75	0.68	0.49
Distance	CS3	78.83	83.76	94.55	106.09	121.03	133.45	156.21	177.49	197.07	203.26	215.63	228.15				151.31
Depth		0.17	0.22	0.50	0.59	1.08	0.95	0.78	1.13	0.89	0.95	0.48	0.11				0.66
Distance	CS4	78.55	98.59	115.01	126.96	133.70	139.64	153.71	166.58	180.35	190.30	203.96	217.21	230.15	235.64		157.09
Depth		0.05	0.09	0.07	1.12	1.48	1.32	1.19	1.03	0.69	0.56	0.05	0.09	0.06	0.12		0.56
Distance	CS5	95.34	99.80	147.96	172.36	185.38	185.45	218.79	264.38	274.77	286.84						191.50
Depth		0.28	0.42	0.75	0.63	1.01	0.87	0.71	0.05	0.06	0.04						0.48
Distance	CS6	108.83	127.36	152.86	177.50	194.37	223.89	253.98	283.13	315.56	326.49						217.66
Depth		0.25	0.32	0.26	0.21	0.99	0.40	1.36	1.48	0.95	0.51						0.67

Table 3: Volume of safely extractable RBM from River Song III

Location	Length Segment (m)	Width of the river (m)	Extractable width (m)	Average Depth of Extraction	Cross Section (m ²)	Average Cross section (m ²)	Volume (m ³)	Cumulative Volume (m ³)
CS1	0	247.71	61.20	0.59	36.05	0	0	0
CS2	770	247.91	123.95	0.49	61.17	48.61	37428.37	37428.37
CS3	900	304.19	151.31	0.66	99.21	80.19	72170.14	109598.51
CS4	600	314.18	157.09	0.56	88.72	93.97	56379.26	165977.77
CS5	690	381.37	191.50	0.48	92.45	90.59	62504.28	228482.05
CS6	370	435.33	217.66	0.67	146.65	119.55	44234.09	272716.14
Total Volume								272716.14
Recommended volume of extraction (90% of total volume)								245444.52

Table 1: Location and relative elevation of various cross-section in river Jakhan I (UTM Zone 48R)

Cross Section I

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3345601.00	232744.20	624.63	3345601.00	232744.60	624.76
3345599.00	232745.30	623.50	3345599.00	232746.00	623.52
3345582.00	232759.00	623.81	3345583.00	232758.30	623.80
3345571.00	232770.70	624.09	3345571.00	232770.20	623.99
3345562.00	232777.90	623.88	3345563.00	232777.50	623.96
3345553.00	232782.70	623.82	3345554.00	232783.50	623.83
3345545.00	232789.00	623.21	3345545.00	232789.80	623.68
3345538.00	232794.50	623.51	3345538.00	232795.90	623.84
3345536.00	232795.00	623.25	3345537.00	232796.80	624.04
3345528.00	232800.70	622.54	3345529.00	232801.90	623.50
3345520.00	232808.10	622.75	3345521.00	232809.40	623.16
3345510.00	232816.10	622.72	3345512.00	232817.20	622.85
3345510.00	232816.80	621.80	3345512.00	232817.10	622.87
3345504.00	232822.00	622.39	3345505.00	232823.50	623.18
3345498.00	232830.20	622.91	3345500.00	232830.40	623.64
3345497.00	232833.00	623.30	3345497.00	232834.10	623.89
3345489.00	232839.40	623.42	3345491.00	232839.70	624.29
3345484.00	232845.40	624.09	3345485.00	232847.10	624.29
3345478.00	232852.70	624.16	3345479.00	232852.90	624.56
3345468.00	232859.30	624.16	3345468.00	232860.50	624.78
3345462.00	232866.30	624.06	3345463.00	232868.00	625.21
3345449.00	232883.10	625.29	3345449.00	232883.00	625.35
3345435.00	232900.90	625.47	3345435.00	232900.00	625.62
3345423.00	232917.40	628.08	3345423.00	232918.00	628.26

Cross Section II

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3344933.00	232572.70	627.41	3344933.00	232572.60	627.60
3344944.00	232556.80	624.36	3344944.00	232556.30	624.20
3344953.00	232545.50	623.90	3344952.00	232545.20	623.88
3344958.00	232533.70	623.52	3344959.00	232534.20	623.44
3344966.00	232524.80	623.14	3344966.00	232524.10	623.26
3344973.00	232516.90	623.34	3344973.00	232516.20	623.26
3344976.00	232508.20	622.40	3344978.00	232508.40	623.59
3344986.00	232497.70	623.06	3344986.00	232498.20	623.36
3344993.00	232491.20	622.89	3344994.00	232491.80	623.13
3344996.00	232488.50	622.43	3344998.00	232488.90	623.03
3345002.00	232479.90	623.18	3345003.00	232481.20	623.25
3345007.00	232468.50	622.12	3345009.00	232468.60	623.31
3345013.00	232454.00	622.54	3345015.00	232454.80	623.42
3345022.00	232436.10	622.77	3345024.00	232437.80	623.41
3345033.00	232418.80	622.58	3345033.00	232420.20	623.03
3345050.00	232398.80	621.28	3345050.00	232400.20	622.22
3345061.00	232383.50	621.69	3345062.00	232384.30	622.39
3345067.00	232378.20	622.62	3345067.00	232379.30	623.27
3345073.00	232370.89	623.54	3345073.00	232371.00	623.68
3345079.00	232358.60	623.47	3345079.00	232359.00	624.03
3345088.00	232341.10	623.39	3345090.00	232343.00	624.37
3345099.00	232330.40	624.52	3345099.00	232331.00	624.63
3345112.00	232315.00	625.06	3345112.00	232314.00	624.92

Cross Section III

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3344808.38	232468.10	625.69	3344808.00	232468.00	625.86
3344810.76	232450.00	624.41	3344812.00	232450.10	624.34
3344814.32	232427.10	624.03	3344813.00	232426.40	624.19
3344814.29	232411.90	623.92	3344815.00	232412.00	623.97
3344815.16	232396.70	623.90	3344814.00	232396.80	623.95
3344816.67	232379.80	621.96	3344817.00	232379.50	622.81
3344819.81	232369.20	622.69	3344821.00	232369.70	622.94
3344825.01	232358.20	621.95	3344825.00	232358.80	622.66
3344829.62	232351.20	622.49	3344831.00	232352.90	623.08
3344835.65	232341.40	621.74	3344837.00	232341.80	622.83
3344833.84	232322.50	622.04	3344835.00	232324.30	622.69
3344838.35	232311.00	622.91	3344839.00	232312.00	623.04
3344843.36	232300.80	621.97	3344845.00	232301.70	622.89
3344852.69	232291.10	622.44	3344853.00	232291.20	623.23
3344858.38	232272.90	622.70	3344860.00	232274.60	622.79
3344868.56	232264.20	621.90	3344869.00	232264.60	622.86
3344876.47	232251.40	621.12	3344877.00	232251.70	622.24
3344882.12	232241.00	621.38	3344883.00	232241.90	622.24
3344891.12	232224.70	622.10	3344892.00	232225.40	622.23
3344899.57	232208.00	621.88	3344900.00	232208.90	622.08
3344908.42	232194.20	621.97	3344910.00	232195.90	622.02
3344922.67	232171.50	622.68	3344923.00	232171.90	622.81

Cross Section IV

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3344463.00	232211.70	619.90	3344463.00	232211.70	619.72
3344470.00	232182.30	617.30	3344470.00	232181.90	617.25
3344485.00	232141.60	617.26	3344485.00	232141.10	617.21
3344484.00	232122.70	616.85	3344484.00	232123.10	617.00
3344485.00	232107.90	617.73	3344485.00	232107.60	617.62
3344490.00	232093.20	617.51	3344489.00	232093.60	617.01
3344493.00	232085.80	615.87	3344494.00	232086.20	616.22
3344513.00	232052.30	616.07	3344514.00	232052.60	616.70
3344522.00	232016.60	616.13	3344522.00	232016.90	616.59
3344524.00	232002.90	616.40	3344525.00	232003.90	616.99
3344537.00	231974.60	618.00	3344538.00	231974.60	618.04
3344561.00	231930.60	617.48	3344561.00	231932.00	618.33
3344592.00	231885.50	618.46	3344592.00	231886.00	618.55
3344609.00	231853.40	618.95	3344610.00	231853.00	618.87
3344632.00	231813.30	619.20	3344632.00	231813.00	619.02

Cross Section V

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3344162.00	231992.10	611.85	3344162.00	231992.10	611.68
3344192.00	231955.80	608.26	3344192.00	231955.00	608.27
3344201.00	231944.20	607.97	3344201.00	231944.20	607.95
3344218.00	231925.40	606.80	3344217.00	231924.60	606.62
3344227.00	231907.30	606.46	3344228.00	231907.90	606.61
3344233.00	231895.90	605.95	3344233.00	231895.00	606.47
3344240.00	231860.10	604.82	3344242.00	231860.40	605.14
3344248.00	231829.60	604.26	3344250.00	231831.20	604.28
3344267.00	231796.30	604.27	3344268.00	231797.90	605.00
3344281.00	231776.00	604.44	3344281.00	231776.50	605.14
3344288.00	231757.60	604.98	3344288.00	231757.80	605.30
3344297.00	231743.50	604.59	3344298.00	231744.60	605.00
3344314.00	231740.60	604.13	3344314.00	231742.20	604.29
3344320.00	231713.60	604.26	3344320.00	231713.00	604.38
3344324.00	231701.80	605.14	3344325.00	231701.00	604.96
3344333.00	231684.90	606.63	3344334.00	231685.70	606.46
3344343.00	231670.80	606.57	3344345.00	231671.50	606.75
3344367.00	231639.30	607.45	3344367.00	231639.00	607.27

Cross Section VI

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3343716.00	231594.80	604.93	3343717.00	231594.60	604.85
3343735.00	231525.30	600.57	3343736.00	231576.00	600.57
3343754.00	231552.60	599.13	3343754.00	231552.00	599.25
3343774.00	231527.20	598.96	3343773.00	231527.00	599.02
3343793.00	231506.60	598.03	3343792.00	231507.40	598.17
3343804.00	231495.70	598.15	3343803.00	231495.30	597.81
3343817.00	231478.40	596.02	3343818.00	231479.90	596.64
3343837.00	231463.10	596.37	3343838.00	231463.70	597.09
3343857.00	231449.80	595.82	3343858.00	231451.30	596.47
3343878.00	231428.30	596.40	3343879.00	231429.00	596.42
3343885.00	231417.30	596.85	3343885.00	231418.60	596.86
3343897.00	231407.00	597.51	3343897.00	231408.60	597.59
3343907.00	231395.60	597.62	3343907.00	231396.70	597.67
3343914.00	231375.60	598.01	3343914.00	231375.40	598.08

Cross Section VII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3343484.00	231406.60	598.89	3343484.00	231406.30	598.90
3343509.00	231355.50	594.51	3343508.00	231356.30	594.39
3343553.00	231314.00	592.07	3343553.00	231313.30	593.11
3343561.00	231298.40	592.06	3343561.00	231298.10	593.16
3343572.00	231283.80	591.24	3343573.00	231283.10	592.31
3343589.00	231261.80	591.65	3343589.00	231261.10	592.05
3343600.00	231250.10	591.29	3343600.00	231250.80	592.05
3343612.00	231236.30	592.48	3343614.00	231238.10	592.59
3343618.00	231226.40	591.84	3343619.00	231227.20	592.49
3343625.00	231218.00	592.10	3343625.00	231219.40	592.19
3343635.00	231216.80	593.18	3343635.00	231217.50	593.19
3343635.00	231215.30	593.99	3343636.00	231216.10	594.06
3343645.00	231206.10	594.43	3343645.00	231208.00	594.55

Cross Section VIII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3343199.20	231098.67	580.19	3343199.25	231098.49	580.19
3343212.59	231079.54	579.03	3343212.73	231079.81	579.03
3343224.46	231057.59	577.96	3343224.56	231057.86	577.90
3343245.40	231038.97	577.36	3343245.28	231038.92	577.59
3343259.11	231013.37	576.99	3343259.41	231013.64	577.20
3343263.80	231001.71	576.63	3343263.98	231001.60	577.32
3343271.94	230993.73	576.41	3343272.23	230993.75	577.07
3343268.70	230988.02	576.20	3343268.86	230988.15	576.94
3343277.01	230981.60	576.16	3343276.76	230981.59	576.76
3343283.76	230966.55	576.95	3343283.80	230966.26	577.27
3343291.66	230951.94	577.32	3343291.77	230951.77	577.64
3343306.50	230937.84	577.54	3343306.27	230937.60	577.70
3343316.21	230919.05	577.51	3343316.26	230918.83	577.66
3343331.86	230907.38	577.05	3343331.91	230907.71	576.86
3343347.63	230896.33	577.25	3343347.69	230896.24	577.34
3343354.11	230887.04	578.85	3343354.01	230887.20	578.81

Table 2: Distance and depth of extraction (Jakhn I)

Distance	CS1	62.16	71.82	81.55	83.02	92.12	103.39	115.32	115.31	124.27	133.08	137.28	145.92	154.93	162.98	176.22	185.27	186.48	124.32
Depth		0.01	0.47	0.33	0.79	0.96	0.41	0.13	1.07	0.79	0.73	0.59	0.87	0.70	0.40	0.67	1.13	1.08	0.62
Distance	CS2	78.59	91.44	105.11	105.67	113.13	128.57	143.26	163.59	183.21	208.49	238.59	254.94	235.76					157.18
Depth		1.15	0.30	0.24	0.60	0.07	1.19	0.88	0.64	0.45	0.94	0.70	0.65	0.75					0.66
Distance	CS3	79.47	88.91	99.15	110.68	117.38	129.45	146.27	159.04	170.37	183.56	200.27	212.39	237.02	298.27	298.27			158.85
Depth		0.41	0.02	0.25	0.71	0.50	1.11	0.65	0.13	0.93	0.79	0.69	0.96	1.12	0.80	0.87			0.69
Distance	CS4	108.24	120.93	129.13	166.97	203.54	216.92	248.08	296.30	324.71									216.47
Depth		0.16	0.50	0.35	0.65	0.45	0.39	1.08	0.85	0.47									0.39
Distance	CS5	102.04	206.67	119.84	151.72	183.68	221.15	246.02	266.03	287.07	297.52	306.11							204.08
Depth		0.07	0.15	0.53	0.22	0.01	0.73	0.76	0.32	0.41	0.16	0.14							0.32
Distance	CS6	73.73	82.94	115.14	131.45	153.14	178.10	201.16	221.20										147.47
Depth		0.09	0.06	0.14	0.33	0.62	0.72	0.65	0.25										0.27
Distance	CS7	63.83	115.87	133.12	151.89	179.53	191.48												127.65
Depth		0.02	1.03	1.10	1.07	0.40	0.71												0.72
Distance	CS8	65.48	75.59	104.01	116.52	127.65	130.40	140.26	156.95	173.86	193.23	186.43							130.95
Depth		0.12	0.23	0.21	0.69	0.56	0.74	0.61	0.33	0.32	0.19	0.11							0.37

Table 3: Volume of safely extractable RBM from River Jakhn I

Location	Length Segment (m)	Width of the river (m)	Extractable width (m)	Average Depth of Extraction	Cross Section (m ²)	Average Cross section (m ²)	Volume (m ³)	Cumulative Volume (m ³)
CS1	0	248.64	124.32	0.62	77.57	0	0	0
CS2	619	313.65	157.18	0.66	103.51	90.54	56042.03	56042.03
CS3	230	317.78	158.85	0.69	108.17	106.34	24457.03	80499.05
CS4	440	432.45	216.47	0.30	65.66	87.42	38463.62	118963.57
CS5	322	407.84	204.08	0.32	65.64	65.65	21139.13	140102.70
CS6	545	294.93	147.47	0.27	40.51	53.07	28924.83	169027.53
CS7	330	258.31	127.65	0.72	92.20	66.36	21897.25	190924.79
CS8	470	261.91	130.95	0.37	48.59	76.34	30769.19	221193.98
Total Volume								221193.98
Recommended volume of extraction (90% of total volume)								199074.58

Table 1: Location and relative elevation of verges pro section in river Jakhan II (Zone 44R)

Cross Section I

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3342107.00	229687.70	549.03	3342106.00	229687.30	548.83
3342108.00	229679.50	547.84	3342109.00	229679.60	547.95
3342116.00	229670.10	548.01	3342117.00	229670.00	548.18
3342124.00	229659.60	547.85	3342123.00	229659.80	547.86
3342132.00	229649.20	547.54	3342132.00	229650.00	547.64
3342140.00	229641.10	548.19	3342140.00	229641.50	548.24
3342143.00	229636.60	547.93	3342144.00	229637.50	547.99
3342148.00	229631.50	547.53	3342149.00	229632.90	548.01
3342154.00	229626.10	546.92	3342155.00	229627.10	547.61
3342159.00	229620.10	547.45	3342159.00	229621.60	547.47
3342163.00	229615.40	547.80	3342164.00	229616.10	547.85
3342169.00	229609.30	547.61	3342170.00	229611.20	547.65
3342175.00	229604.60	547.51	3342176.00	229604.80	547.59
3342182.00	229596.40	547.04	3342183.00	229596.60	547.05
3342187.00	229590.00	547.59	3342188.00	229591.50	547.65
3342193.00	229585.50	547.52	3342194.00	229586.30	547.63
3342200.00	229579.50	547.59	3342201.00	229579.70	547.66
3342201.00	229576.00	549.10	3342201.00	229576.30	549.13

Cross Section II

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3342031.00	229369.10	544.07	3342030.00	229368.80	543.99
3342019.00	229372.50	544.31	3342019.00	229372.00	544.26
3342012.00	229375.70	544.28	3342012.00	229376.10	544.25
3342003.00	229380.00	544.01	3342004.00	229380.40	543.99
3341997.00	229385.30	543.81	3341998.00	229385.50	544.04
3341991.00	229392.20	543.89	3341992.00	229391.50	543.95
3341986.00	229396.40	543.89	3341987.00	229396.50	544.06
3341980.00	229404.40	543.79	3341980.00	229404.40	543.93
3341973.00	229411.00	543.67	3341974.00	229411.20	544.37
3341968.00	229419.70	543.48	3341969.00	229419.80	543.86
3341965.00	229423.20	543.78	3341965.00	229425.00	544.09
3341959.00	229430.40	543.95	3341960.00	229431.10	543.95
3341954.00	229436.50	543.60	3341955.00	229437.50	543.81
3341950.00	229442.80	543.50	3341951.00	229443.10	543.81
3341945.00	229450.50	544.34	3341946.00	229451.30	544.40
3341941.00	229457.90	543.98	3341941.00	229459.00	544.01
3341936.00	229466.50	544.40	3341937.00	229467.60	544.48
3341935.00	229471.50	544.56	3341936.00	229472.50	544.63
3341934.00	229477.60	544.52	3341934.00	229477.80	544.54

Cross Section III

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3341795.00	229358.40	541.77	3341795.00	229358.30	541.62
3341796.00	229353.30	540.57	3341797.00	229354.90	540.75
3341799.00	229352.30	540.70	3341800.00	229351.70	540.85
3341804.00	229347.10	540.65	3341804.00	229347.40	540.81
3341807.00	229344.10	540.93	3341807.00	229343.40	541.04
3341810.00	229338.10	541.10	3341811.00	229339.00	541.08
3341814.00	229335.00	540.79	3341814.00	229334.50	540.88
3341817.00	229329.10	540.80	3341819.00	229329.60	540.83
3341821.00	229323.30	540.92	3341823.00	229324.80	540.95
3341826.00	229319.20	541.31	3341827.00	229320.90	541.24
3341832.00	229316.10	540.99	3341832.00	229316.10	541.03
3341835.00	229309.60	540.93	3341836.00	229310.90	541.10
3341839.00	229306.40	540.37	3341840.00	229306.40	540.87
3341843.00	229300.60	540.41	3341844.00	229300.90	540.54
3341848.00	229294.70	540.71	3341848.00	229294.90	540.79
3341851.00	229288.10	540.05	3341852.00	229288.80	540.56
3341855.00	229281.10	540.74	3341857.00	229281.70	540.93
3341859.00	229276.50	540.53	3341861.00	229277.90	540.70
3341867.00	229270.20	540.30	3341867.00	229271.40	540.45
3341876.00	229261.90	540.23	3341877.00	229263.30	540.71
3341883.00	229254.20	540.27	3341884.00	229255.60	540.82
3341890.00	229246.60	540.48	3341891.00	229247.00	540.57
3341896.00	229235.10	540.92	3341897.00	229236.10	541.01
3341902.00	229224.70	540.85	3341903.00	229226.20	540.86
3341908.00	229218.40	540.60	3341909.00	229218.60	540.65
3341914.00	229209.40	540.88	3341916.00	229209.60	540.98
3341923.00	229197.50	540.48	3341925.00	229199.40	540.55
3341928.00	229188.60	541.24	3341929.00	229190.40	541.24

Cross Section IV

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3341857	228988.7	536.212	3341858	228989.5	536.212
3341848	228990.6	536.289	3341848	228991.8	536.289
3341829	228999	536.392	3341830	228999.7	536.359
3341817	229005.9	536.044	3341816	229006.3	536.124
3341802	229014.5	535.464	3341802	229014.4	535.964
3341789	229016.3	536.267	3341789	229017.2	536.342
3341773	229021.9	535.75	3341774	229021.8	536.12
3341758	229025.2	534.945	3341759	229024.8	535.78
3341745	229029.4	534.977	3341747	229030.1	535.677
3341732	229034.3	534.995	3341733	229035.1	535.69
3341719	229038.7	534.661	3341720	229040.1	535.241
3341704	229043.1	535.056	3341705	229044.7	535.211
3341689	229051.2	534.691	3341690	229052.4	535.141
3341679	229060.9	534.429	3341680	229060.9	534.504
3341673	229065.8	534.489	3341674	229066.8	534.649
3341664	229071	535.778	3341666	229071.9	535.743
3341655	229077.9	535.575	3341656	229079.4	535.665
3341645	229082.5	535.585	3341646	229082.6	535.585
3341644	229081.8	536.207	3341644	229082	536.207

Cross Section V

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3341466	228542.5	529.302	3341466	228542.2	529.329
3341476	228539.4	529.208	3341477	228540	529.213
3341487	228541.3	529.141	3341486	228541.6	529.204
3341495	228545.3	529.019	3341494	228545.6	529.088
3341502	228548.3	528.543	3341502	228548.6	528.555
3341510	228551.2	527.911	3341510	228550.9	528.067
3341520	228553.2	528.26	3341521	228552.9	528.48
3341530	228552.7	527.754	3341530	228553.6	528.419
3341540	228553.2	527.682	3341541	228554	528.317
3341553	228553.7	527.846	3341553	228554.5	528.216
3341564	228553.7	527.418	3341565	228554.7	528.183
3341575	228553.6	527.307	3341576	228554.5	528.067
3341587	228551.6	527.165	3341589	228552.7	528.025
3341601	228552.4	527.977	3341601	228552.4	528.137
3341616	228550.8	528.176	3341617	228551.6	528.216
3341634	228549.6	528.261	3341634	228550.6	528.351
3341646	228548.2	528.188	3341647	228549.2	527.488
3341649	228542.3	528.495	3341650	228542.7	528.495
3341666	228547.2	528.607	3341667	228548	528.607
3341690	228542.8	528.635	3341691	228544	528.635

Cross Section VI

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3341168.70	228000.82	520.32	3341167.70	228000.09	520.36
3341176.20	227997.12	519.91	3341176.80	227998.04	520.04
3341184.00	227994.45	519.72	3341183.10	227995.02	519.73
3341185.90	227994.42	519.33	3341185.80	227994.43	519.29
3341193.80	227989.65	519.02	3341193.10	227989.52	519.05
3341200.50	227985.49	519.35	3341200.30	227984.50	519.45
3341207.50	227978.85	519.31	3341206.60	227979.63	519.09
3341211.80	227972.93	518.78	3341213.20	227974.59	519.09
3341218.00	227968.97	519.09	3341219.70	227970.24	519.24
3341226.30	227964.82	518.39	3341227.40	227965.10	519.31
3341234.10	227957.73	518.96	3341234.20	227959.49	519.17
3341240.80	227951.76	518.73	3341241.90	227952.78	519.04
3341250.70	227944.87	518.47	3341250.80	227946.27	519.27
3341257.30	227939.89	518.56	3341257.30	227940.50	519.11
3341264.90	227932.81	518.33	3341266.00	227933.44	518.74
3341274.80	227926.42	518.78	3341275.90	227927.14	518.88
3341284.00	227920.26	518.47	3341285.20	227920.31	518.80
3341289.00	227914.32	519.72	3341290.90	227914.35	519.74
3341295.90	227907.42	519.72	3341296.80	227908.19	519.64
3341304.50	227900.37	519.86	3341305.50	227900.71	519.91
3341310.70	227894.64	519.93	3341312.50	227894.70	519.93
3341326.60	227886.71	519.96	3341327.60	227886.89	520.05

Cross Section VII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3340962.00	227647.40	511.95	3340962.00	227647.30	512.11
3340972.00	227645.70	512.16	3340973.00	227646.20	512.29
3340982.00	227643.30	512.54	3340982.00	227643.00	512.42
3340993.00	227637.50	512.59	3340993.00	227637.30	512.48
3340999.00	227635.90	510.76	3340999.00	227635.50	510.74
3341006.00	227629.90	510.74	3341007.00	227630.20	510.88
3341014.00	227623.40	511.06	3341014.00	227624.00	511.13
3341020.00	227617.20	510.72	3341022.00	227617.50	511.17
3341030.00	227610.70	510.86	3341030.00	227611.00	511.12
3341043.00	227602.50	510.69	3341044.00	227603.60	511.12
3341049.00	227597.10	510.18	3341050.00	227597.70	510.71
3341053.00	227592.30	510.74	3341055.00	227592.30	510.98
3341057.00	227585.20	510.38	3341058.00	227586.70	511.00
3341061.00	227579.60	510.42	3341061.00	227580.80	510.98
3341064.00	227573.20	510.79	3341065.00	227574.10	511.04
3341069.00	227565.90	510.30	3341070.00	227566.90	510.50
3341071.00	227562.80	511.16	3341071.00	227564.20	511.35
3341077.00	227555.80	511.59	3341078.00	227556.60	511.63
3341086.00	227551.10	511.50	3341087.00	227551.80	511.59
3341119.00	227525.90	512.20	3341120.00	227526.20	512.22

Cross Section VIII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3340890.00	227571.63	511.19	3340891.36	227571.74	511.26
3340895.00	227570.32	510.96	3340894.04	227570.43	511.12
3340898.00	227564.21	510.98	3340896.83	227565.82	510.92
33409004.00	227562.57	510.21	33409002.00	227561.53	510.22
3340906.00	227557.09	509.67	3340908.10	227556.99	509.60
3340916.00	227550.23	509.54	3340914.96	227552.03	509.56
3340921.00	227546.52	510.20	3340920.31	227547.65	510.14
3340925.00	227545.91	509.39	3340924.66	227544.03	509.41
3340929.00	227542.40	509.02	3340928.61	227541.83	509.58
3340938.00	227536.42	509.49	3340936.74	227535.43	510.13
3340941.00	227532.25	509.34	3340942.43	227532.61	510.07
3340948.00	227528.17	509.46	3340947.52	227528.52	510.11
3340955.00	227521.30	509.16	3340954.10	227522.82	509.99
3340962.00	227519.56	509.67	3340962.21	227519.27	510.18
3340968.00	227514.25	509.00	3340966.16	227515.07	510.12
3340975.00	227510.61	509.95	3340974.61	227509.76	510.16
3340981.00	227505.53	509.46	3340982.53	227505.77	509.84
3340996.00	227497.35	509.02	3340995.57	227496.14	509.76
3340999.00	227497.18	509.76	3340998.28	227495.85	510.37
3341001.00	227494.22	509.55	3341000.80	227492.81	510.26
3341004.00	227493.09	511.34	3341004.10	227492.90	511.39
3341007.00	227488.94	511.57	3341007.26	227488.83	511.64
3341017.00	227479.08	512.43	3341017.04	227477.78	512.60
3341023.00	227471.38	510.62	3341024.35	227471.22	513.55
3340868.00	227688.21	511.49	3340866.88	227688.91	514.51

Cross Section IX

Pre-monsoon data			Post monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3340819.00	227531.40	508.21	3340820.88	227530.58	508.24
3340826.00	227521.30	508.36	3340825.79	227522.40	508.38
3340831.00	227515.30	507.58	3340831.48	227516.08	507.51
3340838.00	227509.40	507.10	3340838.85	227507.37	507.19
3340844.00	227502.60	507.10	3340842.92	227501.84	507.21
3340847.00	227595.50	507.36	3340846.79	227596.36	507.37
3340852.00	227490.00	506.75	3340851.54	227489.93	506.80
3340856.00	227483.40	506.31	3340855.34	227483.96	506.46
3340861.00	227479.00	505.86	3340861.94	227477.66	506.73
3340868.00	227474.00	505.66	3340866.79	227472.05	506.74
3340871.00	227463.00	505.15	3340872.19	227464.45	506.28
3340878.00	227454.20	506.20	3340879.05	227455.84	506.29
3340887.00	227446.96	505.65	3340886.47	227447.37	506.47
3340891.00	227441.50	505.77	3340890.17	227441.81	506.44
3340896.00	227435.00	506.28	3340896.82	227433.44	506.42
3340905.00	227423.50	506.17	3340905.39	227421.87	506.53
3340909.00	227416.10	505.36	3340908.23	227416.50	506.23
3340913.00	227411.40	505.28	3340914.99	227409.96	506.33
3340917.00	227407.10	505.07	3340918.84	227405.31	506.56
3340922.00	227402.50	506.64	3340921.33	227401.33	506.73
3340923.00	227397.40	506.84	3340924.21	227396.99	506.97
3340925.00	227392.40	507.21	3340927.12	227393.12	507.23
3340928.00	227390.40	507.31	3340928.97	227389.92	507.36
3340933.00	227385.50	508.49	3340933.15	227385.70	508.44
3340944.00	227369.40	507.66	3340942.67	227370.38	507.76

Cross Section X

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3340819.00	227531.40	501.21	3340820.88	227530.58	501.24
3340826.00	227521.30	500.16	3340825.79	227522.40	499.88
3340831.00	227515.30	499.08	3340831.48	227516.08	499.01
3340838.00	227509.40	499.00	3340838.85	227507.37	498.69
3340844.00	227502.60	498.60	3340842.92	227501.84	498.71
3340847.00	227595.50	498.86	3340846.79	227596.36	498.87
3340852.00	227490.00	497.55	3340851.54	227489.93	498.30
3340856.00	227483.40	497.81	3340855.34	227483.96	497.96
3340861.00	227479.00	497.36	3340861.94	227477.66	498.23
3340868.00	227474.00	497.16	3340866.79	227472.05	497.74
3340871.00	227463.00	496.65	3340872.19	227464.45	497.78
3340878.00	227454.20	497.70	3340879.05	227455.84	497.79
3340887.00	227446.90	496.56	3340886.47	227447.37	497.98
3340891.00	227441.50	497.27	3340890.17	227441.81	497.94
3340896.00	227435.00	497.78	3340896.82	227433.44	497.92
3340905.00	227423.50	497.67	3340905.39	227421.87	498.03

Cross Section XI

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3340301.00	227378.50	500.34	3340300.00	227378.40	500.40
3340305.00	227372.10	499.56	3340305.00	227373.20	499.40
3340312.00	227368.00	499.17	3340312.00	227368.50	499.02
3340317.00	227361.70	498.71	3340318.00	227362.00	498.57
3340321.00	227357.20	498.94	3340322.00	227356.30	498.90
3340327.00	227349.40	497.63	3340326.00	227349.30	497.65
3340331.00	227342.60	498.29	3340331.00	227342.00	498.11
3340334.00	227334.00	497.32	3340335.00	227334.40	498.03
3340335.00	227327.80	498.21	3340337.00	227329.50	498.38
3340340.00	227321.40	496.66	3340340.00	227322.20	497.60
3340342.00	227316.10	497.89	3340342.00	227317.80	497.98
3340344.00	227309.20	496.66	3340345.00	227310.40	497.98
3340347.00	227298.10	497.42	3340348.00	227300.00	498.11
3340350.00	227291.30	497.76	3340351.00	227291.80	498.01
3340351.00	227280.80	497.63	3340352.00	227281.70	498.00
3340355.00	227271.70	497.05	3340356.00	227272.40	497.98
3340358.00	227263.20	495.70	3340359.00	227264.50	497.93
3340359.00	227260.10	498.74	3340361.00	227260.10	498.74
3340363.00	227247.40	498.13	3340365.00	227248.40	498.15
3340370.00	227237.90	498.42	3340372.00	227238.30	498.26
3340384.00	227213.10	498.28	3340386.00	227214.00	498.36
3340389.00	227198.70	498.49	3340391.00	227200.00	498.64
3340389.00	227195.40	500.05	3340391.00	227195.80	499.93

Cross Section XII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3339899.00	227110.20	489.27	3339898.00	227110.90	491.12
3339896.00	227100.20	489.07	3339897.00	227100.60	488.94
3339898.00	227091.50	488.74	3339898.00	227090.70	488.70
3339902.00	227079.90	488.44	3339902.00	227079.60	488.26
3339905.00	227071.60	488.21	3339906.00	227071.70	488.25
3339909.00	227062.90	488.01	3339909.00	227063.20	488.44
3339917.00	227055.10	487.74	3339916.00	227054.20	488.31
3339924.00	227045.80	487.37	3339925.00	227046.10	488.39
3339927.00	227039.10	487.13	3339927.00	227039.50	488.43
3339930.00	227032.30	487.43	3339931.00	227032.30	488.70
3339937.00	227024.70	487.69	3339938.00	227025.40	488.56
3339943.00	227011.60	488.11	3339944.00	227011.90	488.60
3339946.00	227001.60	489.21	3339947.00	227002.80	489.27
3339949.00	226992.40	488.23	3339949.00	226992.50	488.23
3339952.00	226980.80	488.07	3339954.00	226982.70	488.07
3339960.00	226969.60	488.22	3339961.00	226970.10	488.22
3339961.00	226965.70	488.87	3339962.00	226966.60	488.87
3339964.00	226953.90	489.00	3339965.00	226954.10	489.00

Cross Section XIII

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3339582.00	227066.70	485.02	3339582.00	227065.90	485.05
3339581.00	227049.20	483.96	3339583.00	227049.90	484.13
3339584.00	227038.10	483.63	3339583.00	227038.60	483.67
3339587.00	227026.30	483.51	3339586.00	227026.00	483.57
3339589.00	227014.00	483.39	3339589.00	227013.10	483.44
3339591.00	227002.40	483.00	3339592.00	227001.50	483.35
3339592.00	226993.60	482.60	3339592.00	226992.60	483.21
3339590.00	226984.90	481.33	3339590.00	226986.10	482.43
3339589.00	226976.30	482.15	3339589.00	226977.40	482.61
3339588.00	226967.80	481.27	3339590.00	226969.00	482.63
3339594.00	226959.90	481.97	3339594.00	226959.90	482.64
3339594.00	226949.50	480.79	3339596.00	226950.40	482.25
3339597.00	226942.50	482.66	3339597.00	226943.10	482.74
3339597.00	226932.20	482.66	3339597.00	226932.50	482.66
3339596.00	226926.10	483.80	3339597.00	226926.60	483.80
3339593.00	226913.40	482.42	3339595.00	226913.60	482.42

Cross Section XIV

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3339276.00	227023.00	478.69	3339276.00	227023.60	478.64
3339274.00	227036.30	478.28	3339276.00	227036.90	478.43
3339276.00	227050.70	478.70	3339276.00	227050.10	478.85
3339276.00	227062.40	476.20	3339276.00	227062.10	476.97
3339278.00	227068.30	476.24	3339278.00	227067.30	477.21
3339278.00	227075.60	476.41	3339278.00	227074.80	477.07
3339277.00	227084.70	475.80	3339278.00	227083.70	476.73
3339280.00	227091.70	476.36	3339280.00	227093.10	477.00
3339280.00	227096.40	477.35	3339281.00	227096.40	477.68
3339282.00	227102.20	477.62	3339283.00	227102.80	477.96
3339284.00	227107.80	477.75	3339284.00	227109.50	477.75
3339286.00	227118.80	479.32	3339287.00	227119.50	479.32
3339285.00	227123.40	479.55	3339287.00	227123.80	479.55
3339290.00	227132.10	480.42	3339291.00	227133.00	480.85

Cross Section XV

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3338871.00	226967.20	471.94	3338871.00	226966.30	471.95
3338870.00	226956.40	471.68	3338872.00	226956.40	471.56
3338875.00	226946.70	470.28	3338875.00	226946.30	470.44
3338879.00	226935.90	470.71	3338878.00	226936.50	470.53
3338881.00	226932.10	470.46	3338882.00	226931.50	470.46
3338887.00	226922.70	469.53	3338886.00	226921.70	470.29
3338890.00	226914.60	469.95	3338889.00	226915.20	470.39
3338893.00	226904.90	469.28	3338894.00	226906.40	469.68
3338897.00	226896.50	468.60	3338898.00	226897.90	469.87
3338902.00	226891.10	469.00	3338904.00	226892.10	469.84
3338906.00	226887.40	470.27	3338907.00	226888.70	470.27
3338912.00	226879.00	471.32	3338912.00	226880.00	471.32
3338916.00	226870.00	470.55	3338917.00	226871.30	470.55
3338921.00	226864.60	472.23	3338922.00	226866.20	472.23
3338926.00	226856.20	472.10	3338927.00	226856.60	472.10
3338933.00	226840.00	472.16	3338933.00	226841.40	472.16
3338942.00	226828.30	472.51	3338943.00	226829.00	472.51

Cross Section XVI

Pre-monsoon data			Post-monsoon data		
Northing	Easting	Relative elevation	Northing	Easting	Relative elevation
3338451	226986.9	467.0532	3338451	226986	466.954
3338458	226961.1	466.7704	3338459	226962	466.768
3338463	226949.4	466.3759	3338463	226950.3	466.366
3338465	226941.4	466.6111	3338466	226941.2	466.611
3338471	226922.7	464.5317	3338470	226923.2	464.532
3338474	226907.5	463.3283	3338475	226907.4	463.688
3338480	226896.4	463.428	3338481	226896.6	463.756
3338493	226876.3	464.9949	3338493	226877.5	464.905
3338504	226852.8	463.4407	3338506	226854	463.901
3338521	226831.5	465.5737	3338521	226833	465.574
3338537	226808.9	466.5187	3338537	226809	466.578
3338549	226770.9	467.2779	3338549	226772	467.415

Table 2: Distance and Depths of extraction (Jalchan II)

Distance	CS1	36.32	46.05	37.35	62.75	69.45	77.62	85.34	91.29	96.73	107.63	109.56					73.84
Depth		0.07	0.07	0.05	0.06	0.40	0.96	0.07	0.07	0.04	0.09	0.09					8.35
Distance	CS2	56.30	37.82	46.07	52.58	62.32	72.04	81.33	85.80	95.10	102.40	108.00	109.50				73.80
Depth		0.19	0.25	0.06	0.17	0.14	0.71	0.38	0.35	0.00	0.21	0.24	0.27				8.24
Distance	CS3	37.81	56.35	63.40	68.20	75.19	83.62	89.76	98.63	103.89	113.81	126.46	136.76	148.50	159.34	161.73	107.83
Depth		0.01	0.04	0.17	0.50	0.13	0.06	0.51	0.19	0.17	0.15	0.48	0.54	0.10	0.09	0.07	8.72
Distance	CS4	58.15	91.03	74.07	89.54	103.04	118.23	132.75	146.95	162.51	174.68						116.32
Depth		0.40	0.50	0.08	0.37	0.64	0.70	0.70	0.58	0.15	0.36						8.47
Distance	CS5	56.15	84.90	75.38	87.76	96.97	110.54	122.57	135.47	151.10	167.41	168.45					112.30
Depth		0.26	0.86	0.83	0.37	0.76	0.76	0.86	0.89	0.04	0.09	0.03					8.42
Distance	CS6	68.99	53.15	59.94	66.19	77.91	87.89	96.02	107.65	118.83	130.51	147.00	148.96				97.87
Depth		0.42	0.91	0.13	0.95	0.77	0.71	0.80	0.95	0.41	0.10	0.35	0.00				8.44
Distance	CS7	49.79	57.12	56.30	77.00	97.31	101.54	107.54	115.43	119.19	126.13	134.19	137.26	147.06	149.98		99.39
Depth		0.12	0.07	0.45	0.26	0.43	0.56	0.24	0.62	0.56	0.29	0.20	0.19	0.04	0.03		8.59
Distance	CS8	46.64	49.45	60.16	66.45	73.49	80.94	89.85	95.52	106.54	115.49	135.31	134.19	136.96	139.93		93.29
Depth		0.20	0.36	0.84	0.73	0.65	0.89	1.11	1.12	0.21	0.84	0.74	0.61	0.71	0.14795		8.62
After Kachib Marg																	
Distance	CS9	48.83	57.67	85.71	77.15	88.63	94.59	105.90	118.40	125.81	135.75	143.80	149.62	149.40			99.46
Depth		0.29	0.87	0.89	1.15	0.10	0.87	0.87	0.14	0.36	0.87	1.04	1.40	1.54			8.75
Distance	CS10	54.07	40.80	56.09	56.77	71.77	79.02	90.70	99.19	107.22							68.15
Depth		0.06	0.01	0.19	0.28	0.30	1.77	0.17	0.69	0.31							8.34
Distance	CS11	30.93	56.73	81.07	86.93	73.51	81.78	98.65	100.70	109.70	119.40	128.12	132.83				81.92
Depth		0.26	0.71	0.14	0.94	0.06	1.32	0.69	0.29	0.37	0.95	2.24	0.00				8.66
Distance	CS12	42.65	48.93	59.60	75.02	77.07	85.00	94.54	109.23	118.87	127.96						85.31
Depth		0.16	0.43	0.97	1.01	1.31	1.27	0.87	0.49	0.66	0.00						8.63
Distance	CS13	38.23	49.08	51.22	65.24	74.83	80.28	88.83	97.23	106.80	114.68						76.45
Depth		0.05	0.08	0.85	0.35	0.61	1.10	0.46	1.35	0.68	1.24						8.60
Distance	CS14	27.59	58.56	43.79	51.24	60.19	69.60	73.64	79.56	82.77							56.18
Depth		0.00	0.77	0.97	0.66	0.62	0.84	0.32	0.33	0.22							8.54
Distance	CS15	80.74	47.08	54.15	64.03	74.10	80.78	85.31									46.57
Depth		0.17	0.76	0.44	0.41	1.27	0.85	0.00									8.26
Distance	CS16	65.54	82.36	94.38	116.44	143.90	169.75										102.67
Depth		0.00	0.36	0.34	0.00	0.46	0.00										8.19

Table 3: Computation of the estimated quantity for the RBM extraction in Jakhan

Volume of safely extractable RBM from River Jakhan II (Before Kachha Marg)

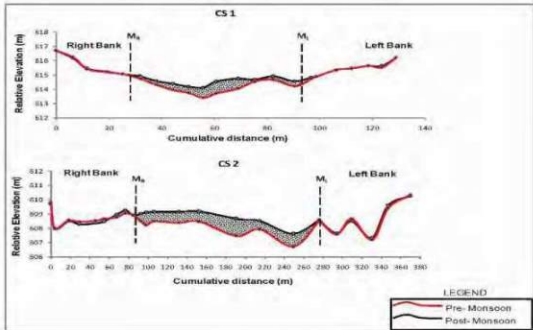
Location	Length Segment (m)	Width of the river (m)	Extractable width (m)	Average Depth of Extraction	Cross Section (m ²)	Average Cross section (m ²)	Volume (m ³)	Cumulative Volume (m ³)
CS1	0	146.08	73.04	0.15	11.05	0	0	0
CS2	290	146.00	73.00	0.24	17.59	14.32	4152.89	4152.89
CS3	175	215.64	107.82	0.22	23.21	20.40	3569.97	7722.86
CS4	270	232.64	116.32	0.47	54.91	39.06	10545.25	18268.11
CS5	500	224.60	112.30	0.42	47.29	54.10	25547.81	43815.92
CS6	700	195.95	97.97	0.44	43.50	45.39	31775.53	75591.45
CS7	410	198.78	99.39	0.29	28.53	36.01	14765.60	90357.06
CS8	165	186.64	93.32	0.62	57.86	43.19	7126.70	97483.76
Total Volume							97483.76	
Recommended volume of extraction (90% of total volume)							87735.38	

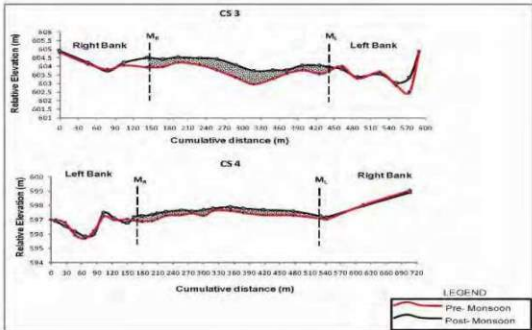
Volume of safely extractable RBM from River Jakhan II (After Kachha Marg)

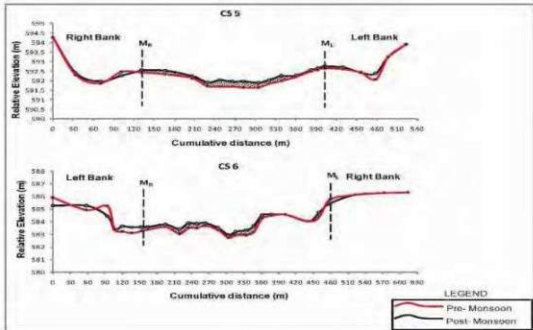
Location	Length Segment (m)	Width of the river (m)	Extractable width (m)	Average Depth of Extraction	Cross Section (m ²)	Average Cross section (m ²)	Volume (m ³)	Cumulative Volume (m ³)
CS9	0	199.31	99.66	0.75	74.37	0	0	0
CS10	120	136.29	68.15	0.34	23.46	48.92	5870.11	5870.11
CS11	420	163.84	81.92	0.66	54.45	38.96	16362.24	22232.35
CS12	470	170.61	85.31	0.62	52.70	53.58	25180.78	47413.13
CS13	350	152.90	76.45	0.60	45.51	49.10	17186.21	64599.34
CS14	320	110.36	55.18	0.54	29.83	37.67	12654.01	76653.34
CS15	420	93.13	46.57	0.56	25.89	27.86	11701.84	88355.18
CS16	400	208.35	102.67	0.19	19.64	22.77	9107.39	97462.57
Total Volume							97462.57	
Recommended volume of extraction (90% of total volume)							87716.31	

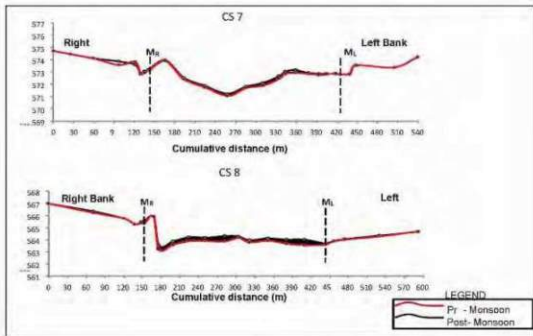


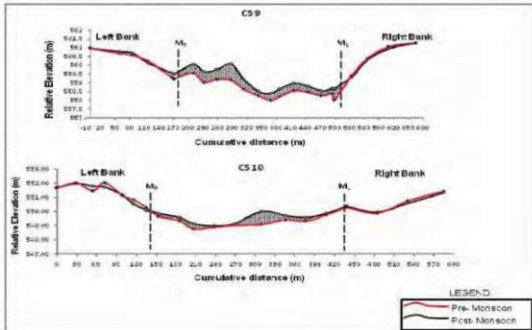
Cross section at River Song f in Belvadan











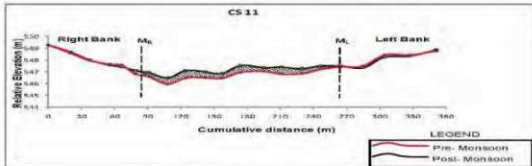


Fig. 7: Cross Sections at different reach of the River Song I

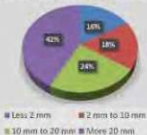
Name of River: Song I (Upper) Reach		
Sr. No	Description of Aggregate	Weight (kg)
1	Less 2 mm	8.00
2	2 mm to 10 mm	9.60
3	10 mm to 20 mm	13.90
4	more 20 mm	24.80
	Total	56.30

RBM % in Song river -I (top side)



Name of River: Song I (Middle) Reach		
Sr.No	Description of Aggregate	Weight (kg)
1	Less 2 mm	9.10
2	2 mm to 10 mm	10.00
3	10 mm to 20 mm	13.20
4	More 20 mm	23.50
	Total	55.80

RBM % in Song river -I (middle side)

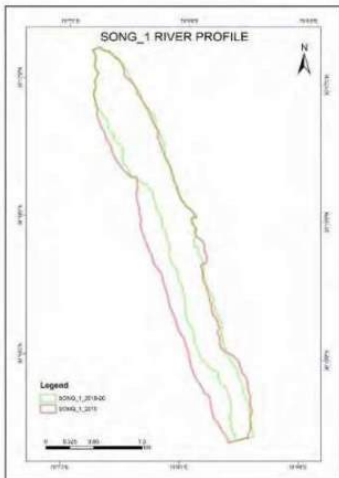


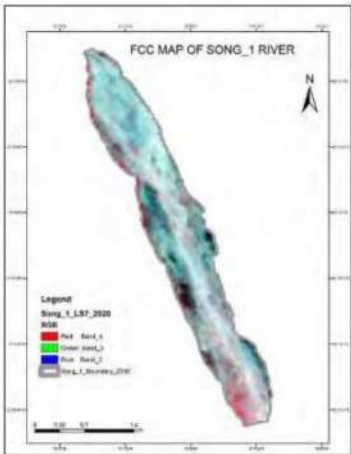
Name of River: Song I (Lower) Reach

Sr.No	Description of Aggregate	Weight (kg)
1	Less 2 mm	9.90
2	2 mm to 10 mm	10.50
3	10 mm to 20 mm	11.60
4	More 20 mm	22.80
	Total	54.80

RBM % in Song river -I (lower side)







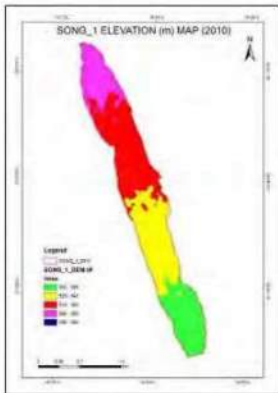
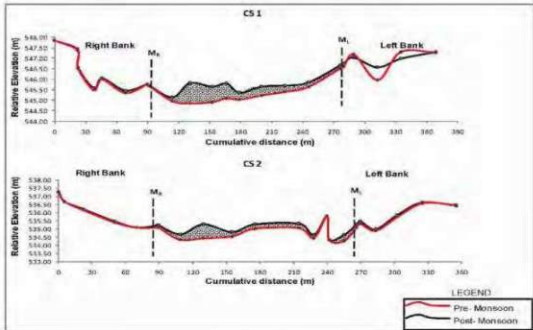
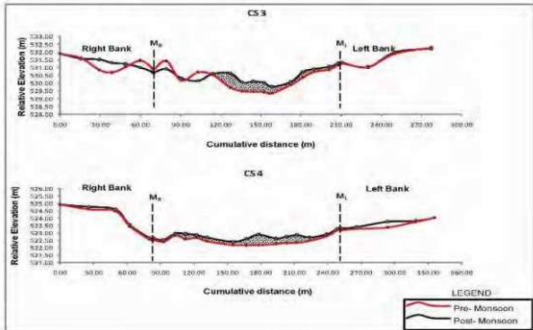
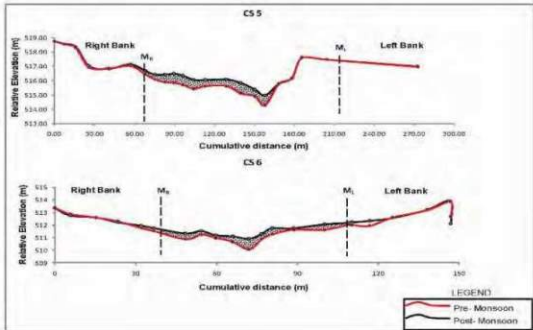


Table: Area wise distribution of elevation of Song 1 during 2010.

Song 1		
Sl No.	ELEVATION (m)	AREA (ha)
1	534-539	62.87
2	539-542	87.60
3	542-545	105.30
4	545-550	53.10
5	550-555	0.38







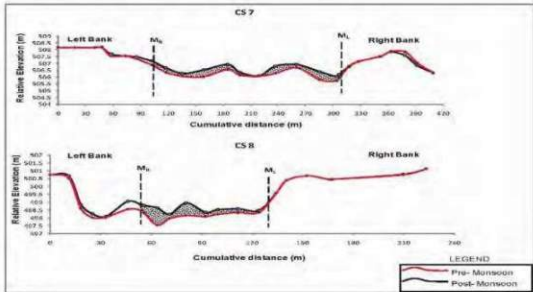


Fig. 7: Cross Sections at different reach of the River Song II

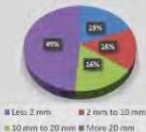
Name of River: Song II (Upper) Reach		
Sr.No	Description of Aggregate	Weight (kg)
1	Less 2 mm	9.50
2	2 mm to 10 mm	8.50
3	10 mm to 20 mm	11.00
4	More 20 mm	27.80
	Total	56.80

RBM % in Song river -II (Top Side)



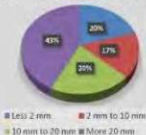
Name of River: Song II (Middle) Reach		
Sr.No	Description of Aggregate	Weight (kg)
1	Less 2 mm	10.60
2	2 mm to 10 mm	8.80
3	10 mm to 20 mm	9.20
4	More 20 mm	27.20
	Total	55.80

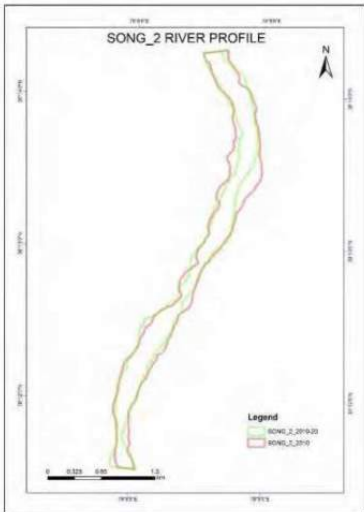
RBM % in Song river -II (middle side)

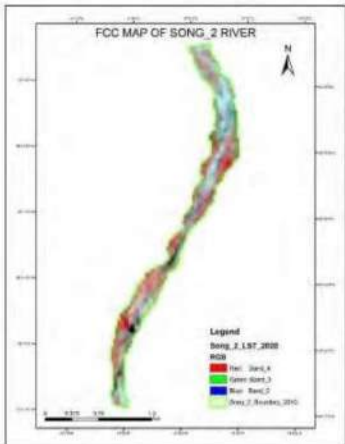


Name of River: Song II (Lower) Reach		
Sr.No	Description of Aggregate	Weight (kg)
1.	Less 2 mm	11.40
2.	2 mm to 10 mm	9.20
3.	10 mm to 20 mm	11.40
4.	More 20 mm	23.80
	Total	55.80

RBM % in Song river -II (lower side)







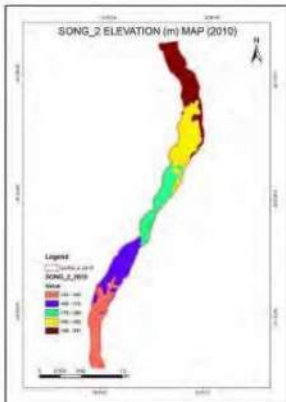


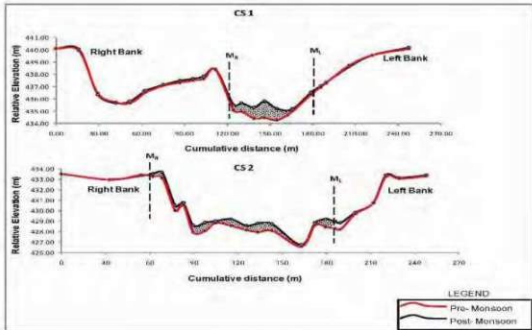
Table: Area wise distribution of elevation of Song II during 2010

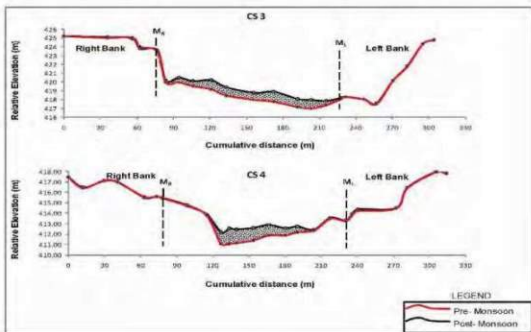
Song II		
Sl. No.	Elevation (m)	Area (ha)
1	440-460	25.47
2	460-470	24.55
3	470-490	23.36
4	490-500	17.91
5	500-502	31.96



C.S.No.	Coordinates	
	Latitude	Longitude
C6-2	8°14'30"N	81°10'30"E
C5-5	8°14'40"N	81°10'30"E
C5-3	8°14'40"N	81°10'30"E
C5-4	8°14'50"N	81°10'30"E
C5-1	8°15'00"N	81°10'30"E
C5-6	8°15'10"N	81°10'30"E

Cross-section at River Song III in Debrajpur





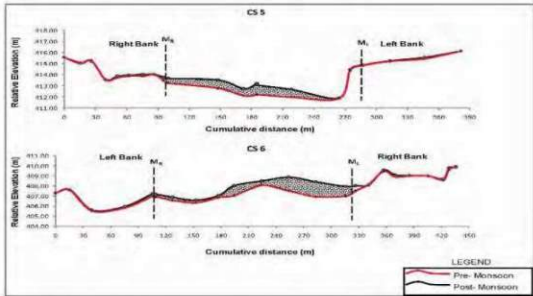


Fig.7: Cross Sections at different reach of the River Song III

Name of River: Song III (Upper) Reach		
Sr.No	Description of Aggregate	Weight (kg)
1	Less 2 mm	9.80
2	2 mm to 10 mm	11.20
3	10 mm to 20 mm	10.90
4	More 20 mm	24.90
	Total	56.80

RBM % in Song river -III (Top side)



Name of River: Song III (Middle) Reach		
Sr.No	Description of Aggregate	Weight (kg)
1	Less 2 mm	9.10
2	2 mm to 10 mm	10.20
3	10 mm to 20 mm	12.80
4	More 20 mm	23.70
	Total	55.80

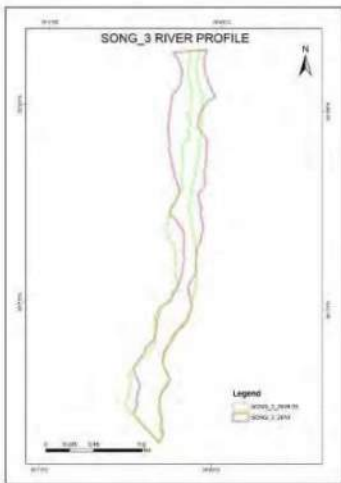
RBM % in Song river -III (middle side)

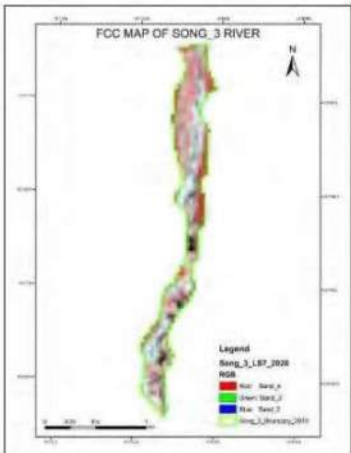


Name of River: Song III (Lower) Reach		
Sr.No	Description of Aggregate	Weight (kg)
1	Less 2 mm	11.40
2	2 mm to 10 mm	9.80
3	10 mm to 20 mm	11.90
4	More 20 mm	22.20
	Total	55.30

RBM % in Song river -III (lower side)







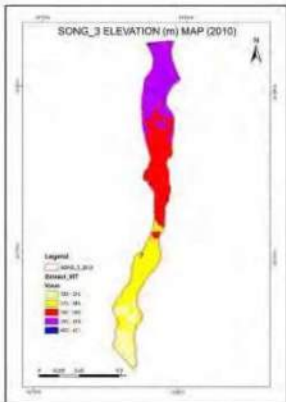


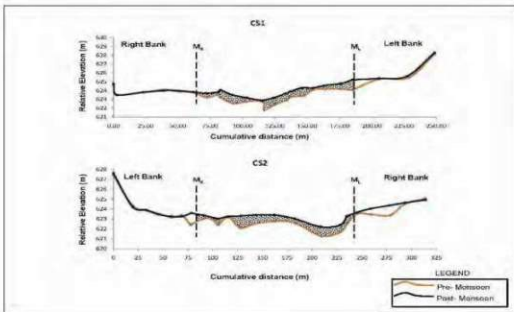
Table: Area wise distribution of elevation of Song III during 2010.

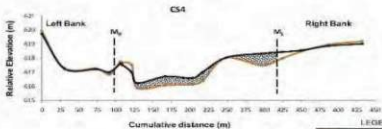
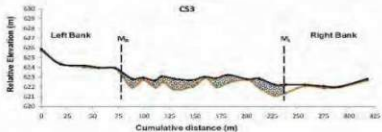
Song III		
Sl. No.	Elevation (m)	Area (ha)
1	365-370	11.97
2	370-380	26.17
3	380-390	26.41
4	390-400	26.37
5	400-401	0.08

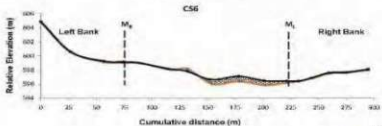
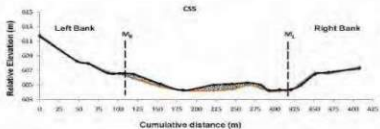


No. of S	Crossing point	
	Left bank	Right bank
10.1	SP101-101	SP101-101
10.2	SP102-102	SP102-102
10.3	SP103-103	SP103-103
10.4	SP104-104	SP104-104
10.5	SP105-105	SP105-105
10.6	SP106-106	SP106-106
10.7	SP107-107	SP107-107
10.8	SP108-108	SP108-108

Cross-section of River Sukhan for Rehabilitation







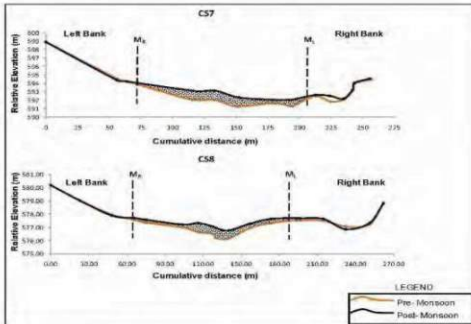
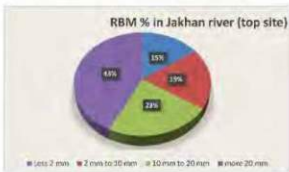


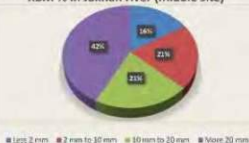
Fig. 7: Cross Sections at different reach of the River Jakhn I

Name of River: Jakhan I (Upper) Reach		
Sr.No	Description of Aggregate	Weight(kg)
1	Less 2 mm	8.50
2	2 mm to 10 mm	10.60
3	10 mm to 20 mm	12.90
4	more 20 mm	23.80
	Total	55.80



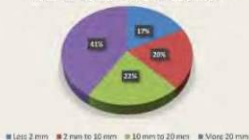
Name of River: Jakhan I (Middle) Reach		
Sr.No	Description of Aggregate	Weight (kg)
1	Less 2 mm	9.00
2	2 mm to 10 mm	11.50
3	10 mm to 20 mm	11.70
4	More 20 mm	23.60
	Total	55.80

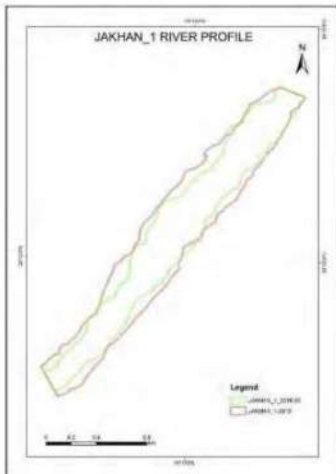
RBM % in Jakhan river (middle site)

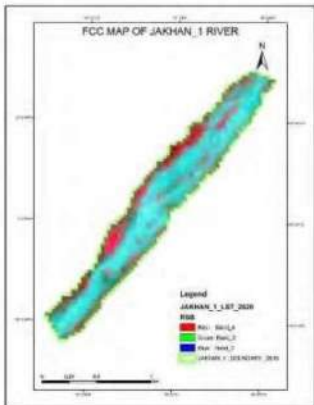


Name of River: Jakhan I (Lower) Reach		
Sr.No	Description of Aggregate	Weight(kg)
1	Less 2 mm	9.60
2	2 mm to 10 mm	11.00
3	10 mm to 20 mm	11.80
4	More 20 mm	22.40
	Total	54.80

RBM % in Jakhan river (lower site)







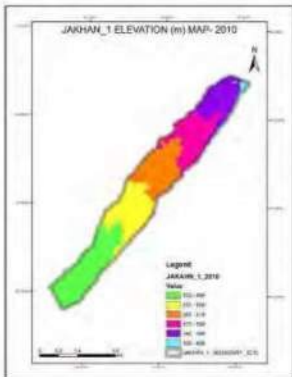
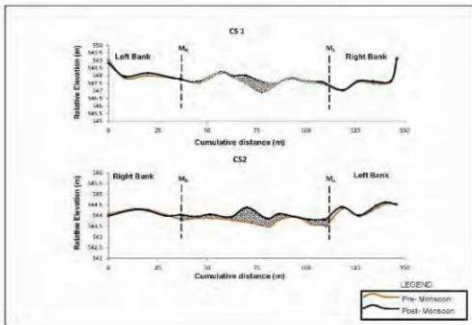
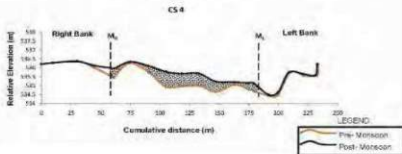
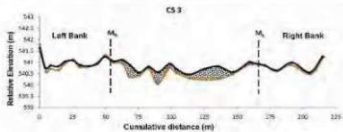
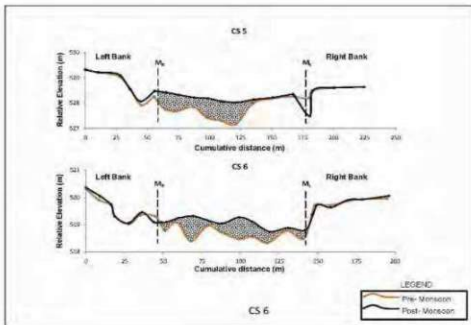


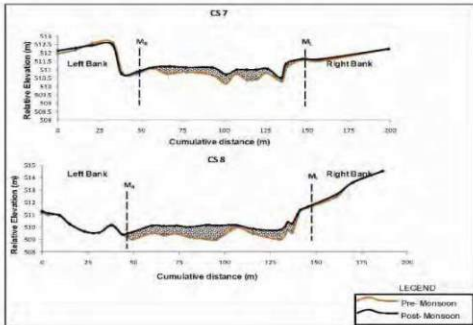
Table: Area wise distribution of elevation of Jakhani I during 2010.

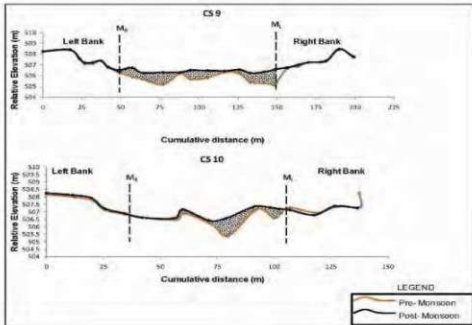
Jakhani I			
Sl. No.	Elevation, m	Area, ha	Area (%)
1	550-555	26.87	26.08
2	555-560	21.22	20.61
3	560-570	20.65	20.16
4	570-580	18.04	17.51
5	580-590	14.73	14.32
6	590-600	1.45	1.40

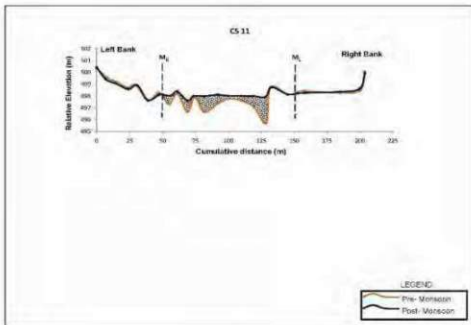


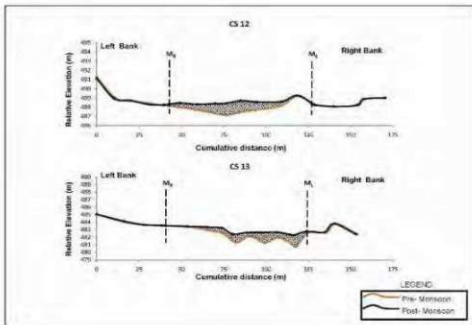


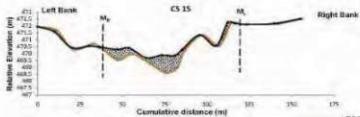
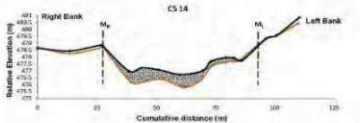












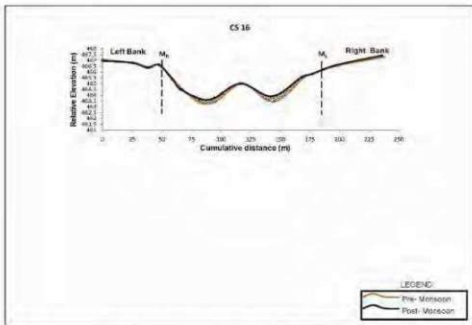
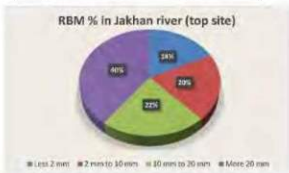


Fig. 7: Cross Sections at different reach of the River Jakhan II

Name of River: Jakhan II (Upper) Reach		
Sr.No	Description of Aggregate	Weight(kg)
1	Less 2 mm	10.30
2	2 mm to 10 mm	11.70
3	10 mm to 20 mm	12.80
4	More 20 mm	23.00
	Total	57.80



Name of River: Jakhan II (Middle) Reach		
Sr.No	Description of Aggregate	Weight(kg)
1	Less 2 mm	11.10
2	2 mm to 10 mm	9.20
3	10 mm to 20 mm	12.80
4	More 20 mm	21.70
	Total	54.80

RBM in Jakhan river (middle site)



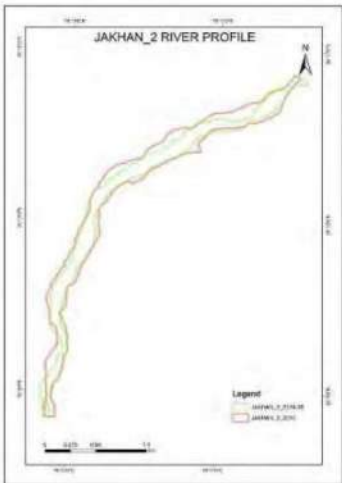
■ Less 2 mm ■ 2 mm to 10 mm ■ 10 mm to 20 mm ■ More 20 mm

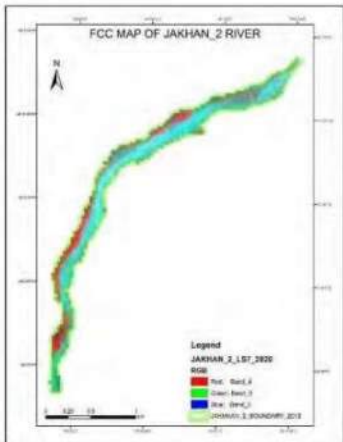
Name of River: Jakhan II (Lower) Reach		
Sr.No	Description of Aggregate	Weight(kg)
1	Less 2 mm	11.80
2	2 mm to 10 mm	9.40
3	10 mm to 20 mm	14.60
4	More 20 mm	20.00
	Total	55.80

RBM % in Kakhan river (lower site)



■ Less 2 mm ■ 2 mm to 10 mm ■ 10 mm to 20 mm ■ More 20 mm





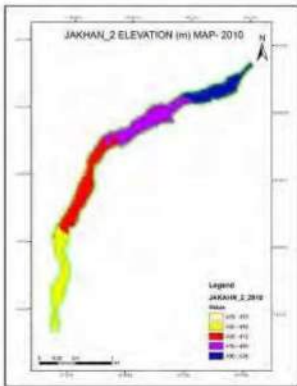


Table: Area wise distribution of elevation of Jakhan II during 2010.

Jakhan II			
Sl No.	Elevation, m	Area, ha	Area (%)
1	425-430	0.95	3.11
2	430-435	17.51	19.76
3	435-440	24.50	28.59
4	440-445	28.3	30.61
5	445-450	17.09	19.89



Sampling of ROM in Song I, II & III



Survey of Song I, II & III



Sampling of RDM in Jakhau I & II