चेक लिस्ट – 22

कैचमेंट ट्रीटमेंट प्लान

SEEPAT ROAD
P.O.: SECL
BILASPUR
जिला: कोरबा(छत्तीसगढ़)
पिन:495452

साउथ ईस्टर्न कोलफिल्ड्स लिमिटेड
South Eastern Coalfields Limited
(कोल इण्डिया का एक अंग/A subsidiary of Coal India Ltd.)
CIN U10102CT1985GOI003161
Website : www.secl-cil.in
कार्यालय: महाप्रबंधक, गेवरा क्षेत्र
OFFICE OF THE GENERAL MANAGER
GEVRA AREA

STD :07815 275430(O)
: 7815 275032(R)
Fax :07815 275434
email :gevraenvt@gmail.com

पो0आ0:गेवराप्रोजेक्ट
P.O. : GEVRA PROJECT
Distt.: Korba (C.G.)
Pin: 495452

कमांक /एसईसीएल/मप्र/गेक्षे/पर्यावरण/2023 दिनांक /04/2023

चेक लिस्ट कमांक–22

" A Detailed note on Soil Productivity or the lack of it"

(भारत सरकार पर्यावरण एवं वन मंत्रालय, क्षेत्रीय कार्यालय, भोपाल का पत्र कमांक 6-MPC013/2008-BHO/357 दिनांक 06.01.2011)

27 सितम्बर 2017 में स्टेज 1 कें शर्त कमांक xii के अनुसार CAT प्लान बनवाने हेतु निर्देशित किया गया था, परन्तु SECL Gevra OCP के 4781.798 हे. सम्पूर्ण माइन लीज एरिया का एवं 5 कि.मी. के क्षेत्र का CAT Plan बनाया गया है। जिसमें 94.293 हे. राजस्व वनभूमि भी शामिल है, तथा CAT plan की राशि रु 8447900/– कैम्पा में जमा करा दिया गया है ।

CAT Plan का कापी संलग्न है।

महाप्रबंधक
General Manager
एस.ई.सी.एल., गेवरा क्षेत्र
SECL, Gevra Area

AGENCY COPY

यूनियन बैंक Union Bank of India

NEFT / RTGS CHALLAN for CAMPA Funds

Date : 02-11-2021

Agency Name.	SOUTH EASTERN COALFIELDS LTD
Application No.	5813199333
MoEF/SG File No.	8-41/2017-FC
Location.	CHATTISGARH
Address.	Post Box No. 60 Seepat Road Bilaspur ChhattisgarhBilaspur
Amount(in Rs)	8447900/-

Amount in Words :Eighty-Four Lakh Forty-Seven Thousand Nine Hundred Rupees Only

NEFT/RTGS to be made as per following details:

Beneficiary Name:	CHATTISGARH CAMPA
IFSC Code:	UBIN0903710
Pay to Account No.	150645813199333 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India Lodhi Complex Branch, Block 11,CGO Complex, Phase I, Lodhi Road, New Delhi -110003

- **This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only**

BANK COPY

यूनियन बैंक Union Bank of India

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After making successful payment, User Agencies may send a line of confirmation through Email: helpdeskcampa@corpbank.co.in

Note:After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date to Email: cb0371@unionbankofindia.com

Invoice Voucher

South Eastern Coalfields

2000006261
8/11/21

...Place : BP22
...Document No. : 5200012190

Section : 8651
Posting Date : 3/11/2021

: 8447900
: Eighty Four Lakh Forty Seven Thousand Nine Hundred Rupees
:

: CHHATTISGARH CAMPA ,
: [illegible]
:
: UNION BANK OF INDIA
: UBIN0902710
: CAMDVREDNV
:

CEMP Vendor :
CEMP Code :
GST :
Bank Branch : LODHI COMPLEX
Bank A/c No. : 150645871200217
Date : 28/10/2021

PK	G/L Acount	G/L Account Description	Profit Centre	Cost centre	Amount
31	10900060	Statutory Vendor			-8447900
86	11000011	SR/IR clearing account	SECL8652	SEC8652115	8447900

Parked by
BPAST_8651

Parking Date
3/11/2021

Parking Time
12 00 11 PM

Signature 8/11/21

Posted By
CUNIT_8651

Posting Date
3/11/2021

Signature

Approver

Signature

UCO
003819
8/11/21

Scanned with CamScanner

SEEPAT ROAD
P.O.: SECL
BILASPUR

साउथईस्टर्नकोलफिल्डस्लिमिटे
South Eastern Coalfields Limited
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P.O. : GEVRA PROJECT
Distt.: Korba (C.G.)
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क्रमांक/एस.ई.सी.एल/मप्र/गे.क्षे./ पर्यावरण/2020 / 282 दिनांक 02/09/2020

To
The DFO
Katghora Division
Katghora Korba

SUB. Submission of Estimate on Erosion Control Recommendations (Proposed Structure) of Comprehensive Catchment Area Treatment Plan study by Chhattisgarh Council of Science & Technology in respect of SECL Gevra OCP.

Dear Madam

Please find enclosed herewith the Estimate on Erosion Control Recommendations (Proposed Structure) of Comprehensive Catchment Area Treatment Plan study by Chhattisgarh Council of Science & Technology. The final report on Comprehensive Catchment Area Treatment Plan was previously submitted vide letter no. क्रमांक/एस.ई.सी.एल/मप्र/गे.क्षे./पर्यावरण/2020/234 दिनांक 15/07/2020

This is in compliance to the Condition no. xii of 112.385 ha. Stage I/ In principle approval vide no. L.No. 8-41/2017-FC dated 27.09.2017 in respect of SECL Gevra OCP, which states "With a view to enrich the water regime in the area, a comprehensive Catchment area Treatment Plan in the area to arrest flow of silt in the Hasdeo River and to improve water regime should be implemented at the project cost."

Thanking You

Yours Sincerely

General Manager
SECL Gevra Area

Copy to. 1. Additional Principal Chief Conservator of Forest (Land Management), Naya Raipur, CG
2. Chief Conservator of Forest, Bilaspur Division, Bilaspur CG

SOUTH EASTERN COALFIELDS LIMITED

(A MINI RATNA COMPANY)

BILASPUR (CHHATTISGARH)

GEVRA OC PROJECT

PROJECT REPORT

ON

Erosion Control Recommendations (Proposed Structure) of Comprehensive Catchment Area Treatment Plan study by Chhattisgarh Council of Science & Technology

1.9.20
SOE(C)

नोडल ऑफीसर (पर्यावरण/वन)
Nodal Officer (ENVI/FOR)
SECL/Gevra Area
एस.ई.सी.एल./गेवरा क्षेत्र

महा प्रबंधक (संचालन)
General Manager (O)
एस.ई.सी.एल., गेवरा क्षेत्र
SECL, Gevra Area.

INTRODUCTION

Gevra Opencast Project is an operating Opencast Mine of South Eastern Coalfields Limited, located in the South-Central part of Korba Coalfield in Korba District of Chhattisgarh. The project has obtained Environment Clearance of 45 MTPA vide no. No.J-11015/85/2010-IA.II (M) Dt. 04.06.2020 for a period of 30 years or life of the mine, whichever is earlier within the mine lease area of 4184.486 ha.

Forest land involved is 1016.412 ha. Out of which 904.027 Ha. of Forest land has obtained stage II clearance & is under possession of Gevra OCP & 112.385 ha. of Revenue Forest land has obtained Stage I/In-Principle approval & is in the process of obtaining Stage II Clearance.

The Condition no. xii of 112.385 ha. Stage I/ In principle approval vide no. L.No. 8-41/2017-FC dated 27.09.2017 states "With a view to enrich the water regime in the area, a comprehensive Catchment area Treatment Plan in the area to arrest flow of silt in the Hasdeo River and to improve water regime should be implemented at the project cost." (Copy Enclosed as annex 1)

& similarly

The Condition no. iv of 45 MTY Environment Clearance vide NoJ-11015/85/2010-IA.II (M) Dt. 04.06.2020 states "Final recommendation/outcome of the study on Ecosystem carrying capacity by IIT-BHU and Catchment area treatment plan study within 5 KM from Mine Lease Boundary by CCOST shall be implemented in certain timeframe. PP shall submit action plan with timeline to Ministry's Regional Office for implementation of recommendation" (Copy Enclosed as annex 2)

In compliance to the above conditions, work order on study on Comprehensive Catchment Area Treatment Plan within 5 KM from Mine Lease Boundary was awarded to Chhattisgarh Council of Science & Technology (CCOST) vide no.259 dated 23.03.18 (Copy Enclosed as annex 3). accordingly Final Study report was submitted by CCOST on 17.03.2020. (Study has been carried for the project area of 4781.798 ha. (considering future expansion of 70 MTPA). & within 5KM from this Mine Lease Boundary).

Chief ... A.H.Q. GEVRA AREA

SOE(C)

RECOMMENDATIONS IN THE STUDY REPORT

The recommendations in the Catchment area treatment plan study for erosion control measures (Proposed Structures) for Gevra OCP is as below

Erosion Control Measures (Proposed Structures)	Number of Structures
Check Dams	7
Nala Bunds/ Boulder Checks	11
Vegetative Bunds	13

Similar type of study i.e. "study on Catchment Area Treatment Plan" in respect of Kusmunda OCP was done. The study was conducted by Chhattisgarh Council of Science & Technology (CCOST), Raipur. On comparing both the reports it was observed that there was overlapping of 1 check dam, 3 Nala Bunds/ Boulders Checks & 1 vegetative bund.

Subsequently due to the overlapping of the above mentioned structures, a joint inspection/ meeting of both the areas was held. After the inspection & discussions it was decided that the implementation of erosion control measures (Proposed Structures) for Gevra OCP will be as below

Erosion Control Measures (Proposed Structures)	Number of Structures
Check Dams	6
Nala Bunds/ Boulder Checks	9
Vegetative Bunds	12

And implementation of 1 check dam, 2 Nala Bunds/ Boulders Checks & 1 vegetative bund (overlapped structures in both reports) will be taken up by Kusmunda OCP.

The Erosion Control Measures (Proposed Structure) within Mine lease area (4781.798 Ha.) will be implemented by SECL Gevra OCP & for implementation of the Erosion Control Measures (Proposed Structure) outside Mine lease area will undertaken through State Forest Department by depositing fund in CAMPA.

(Details given in subsequent pages)

AHQ [illegible] AREA

1.9.20

DETAILS WITH LOCATION OF PROPOSED STRUCTURES

WITHIN MINELEASE AREA			
S.No.	Latitude	Longitude	Structure Code
1	22°18'51.79" N	82°33'40.58" E	VB
2	22°18'47.66" N	82°33'25.05" E	VB
3	22°20'36.09" N	82°37'36.99" E	VB
4	22°20'28.60" N	82°37'32.82" E	VB
5	22°20'48.24" N	82°36'46.76" E	VB
6	22°20'40.76" N	82°36'41.51" E	VB
7	22°20'33.28" N	82°36'43.07" E	VB
8	22°21'55.58" N	82°35'06.91" E	VB
9	22°19'11.16" N	82°33'24.28" E	NB/BC
10	22°19'03.19" N	82°33'41.77" E	NB/BC
11	22°20'52.84" N	82°37'00.89" E	NB/BC
12	22°20'51.87" N	82°36'53.23" E	NB/BC
13	22°18'53.07" N	82°38'08.24" E	CD

*Note. CD. Check Dam, NB/BC. Nalla Bunds/Boulder checks, VB. Vegetative Bunding

Within Minelease				
Structure	Number	m/each	Rs./m	Cost Rs.
Check Dam	1	20	63113.85	1262277
Nalla Bund/Boulder Check	4	15	3137.09	188225.4
Vegetative Bund	8	20	1877.97	300475.2
				Rs.1750977.60

*Detailed estimate in subsequent pages

The above work within Mine Lease will be implemented by SECL Gevra OCP

1/9/20

1.9.20

DETAILS WITH LOCATION OF PROPOSED STRUCTURES

OUTSIDE MINELEASE AREA			
S.No.	Latitude	Longitude	Structure Code
1	22°17'11.39" N	82°33'34.70" E	CD
2	22°18'15.21" N	82°33'09.12" E	CD
3	22°17'56.80" N	82°36'39.19" E	CD
4	22°17'43.13" N	82°36'19.15" E	CD
5	22°17'07.66" N	82°39'27.18" E	CD
6	22°18'20.74" N	82°33'30.22" E	VB
7	22°18'44.59" N	82°35'43.49" E	VB
8	22°18'55.36" N	82°36'05.52" E	VB
9	22°21'42.70" N	82°34'51.18" E	VB
10	22°18'29.18" N	82°33'50.32" E	NB/BC
11	22°18'38.84" N	82°34'54.85" E	NB/BC
12	22°18'35.66" N	82°36'07.42" E	NB/BC
13	22°18'16.32" N	82°35'53.47" E	NB/BC
14	22°21'22.38" N	82°38'53.48" E	NB/BC

*Note: CD, Check Dam, NB/BC, Nalla Bunds/Boulder checks, VB, Vegetative Bunding

Outside Minelease				
Structure	Number	m/each	Rs./m	Cost in Rs.
Check Dam	5	20	63113.85	6311385
Nalla Bund/Boulder check	5	15	3137.09	235281.75
Vegetative Bund	4	20	1877.97	150237.6
				Rs.6696904.35

*Detailed estimate in subsequent pages

The implementation of the above work outside Mine lease area will be undertaken through State Forest Department by depositing fund in CAMPA.

1.9.20

DETAILS WITH LOCATION OF PROPOSED STRUCTURES

S.No.	Latitude	Longitude	Structure Code
1	22°21'12.07" N	82°38'12.59" E	NB/BC
2	22°20'53.34" N	82°37'08.00" E	NB/BC
3	22°20'59.17" N	82°37'38.70" E	CD
4	22°20'50.04" N	82°37'37.22" E	VB

* The implementation of the above work outside Mine lease area will be done by SECL Kusmunda OCP

1.9.20

GENERAL ABSTRACT OF COST

(A) CHECK DAM:

Total No. 6 nos. @ 20.00 m/e (avg.) = 120.00 mtrs @ Rs. 63113.85/m
= 7573662.00

(B) NALLAH BUND/BOULDER CHECK:

Total No. 9 nos. @ 15.00 m/e (avg.) = 135.00 mtrs @ Rs. 3137.09/m
= 423507.15

(C) VEGETATIVE BUNDS:

Total No. 12 nos. @ 20.00 m/e (avg.) = 240.00 mtrs @ Rs. 1877.97/m
= 450712.80

Rs. = 8447881.95

1.9.20
SDE (C)

Construction of Check dam Details for 20.00 length check dam					
S.No.	Description of Item	Qty.	R/U	Updated Amount	Remark
1	Earth work in excavation over areas.....etc	159.30 cum	206.41	32881.11	DSR '13. I/2.6.1
2	Providing and laying c.c.1:4:8.....etc	53.10 cum	4158.48	220815.28	I/4.1.8
3	Providing and laying c.c.1:3:6.....etc	69.9 cum	4714.52	329544.94	I/4.1.4
4	Providing and laying c.c.:1:2:4 in foundation & plinth	53.40 cum	4645.61	248075.57	I/4.1.3
5	Providing and laying c.c.:1:2:4 in wall .....etc	41.67 cum	5481.95	228432.85	I/4.2.3
6	structural steel work .....etc,	900.00 kgs	85.70	77130.00	I/10.2
7	centering and shuttering work .....etc, in of .& raft	103.00 Sqm	240.13	24733.39	I/5.9.1
8	centering and shuttering wall. etc	182.10 sqm	503.29	91649.1	I/5.9.2
9	Filling available excavated earth.....etc	53.10 cum	169.77	9014.78	I/2.25
cost of 20.00 mtr = Rs. 1262277.02					
cost of per mtr = Rs. 63113.85					

DETAIL CALULATION

Item 1) Earth work in ex. Over areas..... etc.

Dam: $1 \times 20.00 \times 3.00 \times 1.50 = 90.00$ cum

Toe wall: $1 \times 20.00 \times 0.90 \times 0.75 = 13.50$ cum

Wing wall: $2 \times 15.00 \times 1.20 \times 1.55 = 55.80$ cum

Total = 159.30 cum

Item 2) P. & L. C. C. 1:4:8..... etc.

Dam: $1 \times 20.00 \times 3.00 \times 0.15 = 9.00$ cum

Toe wall: $1 \times 20.00 \times 0.90 \times 0.15 = 2.70$ cum

Apron: $1 \times 2 \times 20.00 \times 6.00 \times 0.15 = 36.00$ cum

Wing wall: $1 \times 2 \times 15.00 \times 1.20 \times 0.15 = 5.40$ cum

Total = 53.10 cum

Item 3) P. & L. C. C. 1:3:6..... etc.

Wing wall: $1 \times 2 \times 15.00 \times (1.00 + 0.80)/2 \times 0.90 = 24.30$ cum

Wing wall: $1 \times 2 \times 15.00 \times 0.70 \times 0.60 = 12.60$ cum

Wing wall: $1 \times 2 \times 15.00 \times 0.60 \times 1.50 = 27.00$ cum

Toe wall: $1 \times 20.00 \times (0.60 + 0.40)/2 \times 0.60 = 6.00$ cum

Total = 69.90 cum

Item 4) P. & L. C. C. 1:2:4.....:n Foundation..... etc.

Apron: $1 \times 2 \times 20.00 \times 6.00 \times 0.10 = 24.00$ cum

Main wall: $1 \times 20.00 \times 2.60 \times 0.30 = 15.60$ cum

Main wall: $1 \times 20.00 \times 2.30 \times 0.30 = 13.80$ cum

Total = 53.40 cum

1.9.20
SDO(C)

Item 5) P. & L. C. C. 1:2:4.....in wall

1 × 20.00 × 2.00 × 0.15 = 6.00 cum

1 × 20.00 × (2.00 + 0.90)/2 × 1.50 = 43.50 cum

Less for Openings: 6 × 0.60 × (2.00 + 0.90)/2 × 1.50 (-) = 7.83 cum

Total = 41.67 cum

Item 6) Structural Steel work ..... etc.

For gate 06 Nos. @ 150.00 kg/e = 900.00 kgs

Item 7) Centering and Shuttering work.....etc.

For foundation: 2 × 20.00 × (0.30 + 0.30) = 24.00 sqm

2 × 20.00 × 0.25 = 10.00 sqm

2 × 15.00 × 1.50 = 45.00 sqm

2 × 20.00 × 0.60 = 24.00 sqm

Total = 103.00 sqm

Item 8) Centering and Shuttering work.....etc.

For wall:

Main wall	2 × 20.00 × 0.15	= 6.00 sqm
	2 × 20.00 × 1.50	= 60.00 sqm
Wing wall	2 × 2 × 15.00 × 1.50	= 90.00 sqm
For Opening Portion	6 × 2 × (2.00 + 0.90)+1.50	= 26.10 sqm

Total = 182.10 sqm

Item 9) Filling available excavated earth.....etc.

1/3 of Item (1) = 159.30 cum/3 = 53.10 cum

Chief Manager (C)
AHQ CHEYRA AREA

Construction of nallah bund Details for cost of 10.00 m length					
s.no.	Description of item	Qty.	R/U	Updated Amount	Remark
1	Earth work in excavation in foundation & trenches......etc, 10.00 x 0.90 x 0.60=5.40 cum	5.40 cum	194.10/cum	1048.14	DSR 13 I/2.8.1
2	Supplying and stacking of good quality of stone boulder 15 to 22.50 cm size at work site all leads etc. 10.00 x 0.90 x 1.50 = 13.50 cum less for voids 15% (-) 2.02	11.48 cum	1153.71/cum	13244.59	Non DSR Rate analysis
3	laying of stone boulder in making nallah bund including packing, labour charges, cost of T & P., all lead & lift as per instruction of engineer -in-charge , same as item (2) i.e.11.48 cum	11.48 cum	446.03/cum	5120.42	Non SOR Rate analysis
4	Providing and making fencing with bamboo (65 mm to 100 mm dia)vertical post @ 2.00 m c/c. and bracing (two nos diagonal in each span and six nos horizantal) including cost of material labour charges cost of tools & plants as per instruction of engineer- in- charge 10.00 M x 2 sides =20.00M	20.00 mtr	597.89/m	11957.80	Non SOR Rate analysis
	cost of 10.00 mtr =			Rs. 31370.95	
	cost of per mtr =			Rs. 3137.09	

1/9/20 1.9.20

Chief Manager (C)
AHQ GEVRA AREA

RATE ANALYSIS

Item: Supply & Staking stone boulder of size 15 to 22.50 cm at work site including cost of T & P labour charges as per instruction of engineer-in-charge.

UNIT: 12.00 cum

(A) Material: supply of boulder I/c carriage

	12.00 cum @ Rs. 910.00/cum	=	10920.00
(B) Labour: for stacking	02 nos. @ Rs. 499.80/e	=	999.60
			11919.60
	Add water charges 1%	=	119.19
			12038.79
	Add Contractor's profit 15%	=	1805.81
	Cost of 12.00 cum	=	13844.60
	Cost of per cum	=	1153.71

RATE ANALYSIS

Item: Laying of stone boulder in making bund/Nallah bund including packing labour charges, cost of T & P etc. as per instruction of engineer-in-charge.

UNIT: 10.00 cum

Labour Required: (Labour wages 1/c 19 % CMPF & CMPS)

Mate 01 Nos. @ Rs. 585.48/e	=	585.48
Mason IInd class 01 No. @ Rs. 705.67/e	=	705.67
Bolder 05 Nos. @ Rs. 499.80/e	=	2499.00
		3790.15
Sundries L. S.	=	50.00
		3840.15
Add water charges 1%	=	38.40
		3878.55
Add Contractor's profit 15%	=	581.78
Cost of 10.00 cum	=	4460.33
Cost of per cum	=	446.03

RATE ANALYSIS

Item: Providing and making fencing with bamboo (65 mm to 100 mm dia) vertical post @ 2.00 m c/c and bracing two Nos. diagonal and six Nos. horizontal including cost of bamboo, labour charges, and cost of T & P as per instruction of engineer-in-charge.

UNIT: 10.00 M

(A) Material: Bamboo (65 mm to 100 mm dia)

Vertical Post	6 × 1.50	= 9.00 m		
Dia. Bracing	5 × 2 × 2.00	= 22.00 m		
Hor. Bracing	6 × 10.00	= 60.00 m		
Including carriage		= 91.00 m @ Rs. 36.00/m	=	3276.00
Sundries + wire nails etc._ L. S.			=	50.00

(B) Labour: Mate 0.50 @ Rs. 585.48/e	=	292.74
Carpenter 0.75 @ 705.67/e	=	529.25
Balder 2.00 @ 499.80/e	=	999.60
		5147.59
Add water charges 1%	=	51.47
		5199.06
Add Contractor's profit 15%	=	779.86
Cost of 10.00 mtr	=	5978.92
Cost of per mtr	=	597.89

1/9/20
मुख्य प्रबंधक (सिविल)
क्षेत्रीय मुख्यालय गेवरा क्षेत्र
Chief Manager (C)
A HQ GEVRA AREA

1.9.20
SOE (C)

Construction of vegetative bunds
Details of cost for 10.00 length

s.no.	Description of item	Qty.	R/U	Updated Amount	Remark
1	Providing and placing empty cement bag filled with local available sandy soil including stitching of bag and placing in position cost of labour empty bag etc. as per instruction of engineer-in-charge	850 nos.	12.38/e	10523.00	Rate analysis
2	filling local available soil for vegetative bund including planting of near by available vegetation to protect erosion of soil cost of T.& P. labours charges as per instruction of engineer-in-charge	37.50 cum	220.18/cum	8256.75	Rate analysis
		cost of 10.00 mtr =		Rs. 18779.75	
		cost of per mtr =		Rs. 1877.97	

DETAIL CALCULATION

Item(1) Providing & placing empty cement bag filled with local available sandy soil...etc

For 10.00 × 2.00 × 1.50 mtr

No. of bag = 17 × 5 × 10 = **850 Nos.**

Item(2) Filling local available soil for vegetative bund including planting of vegetation to protect erosion of soil cost of T & P and labour charges as per instruction of engineer-in-charge.

1 × 10.00 × 3.00 × (1.50 +1.00)/2 = **37.50 cum**

RATE ANALYSIS

Item: Providing and placing empty cement bag filled with local available sandy soil including Stitching of bags & placing in position, cost of labour, empty bag etc. as per instruction of engineer-in-charge.

UNIT: 75 Bags

Cost of empty cement bag 75 Nos. @ Rs. 4.00/bag	=	300.00
Labour unskilled 01. No. @ Rs. 499.80/e	=	499.80
		799.80
Add water charges 1%	=	7.99
		807.79
Add Contractor's profit 15%	=	121.16
Cost of 75 Nos.	=	928.95
Cost of per Nos.	=	12.38

1/9/20

1.9.20
SDE(C)

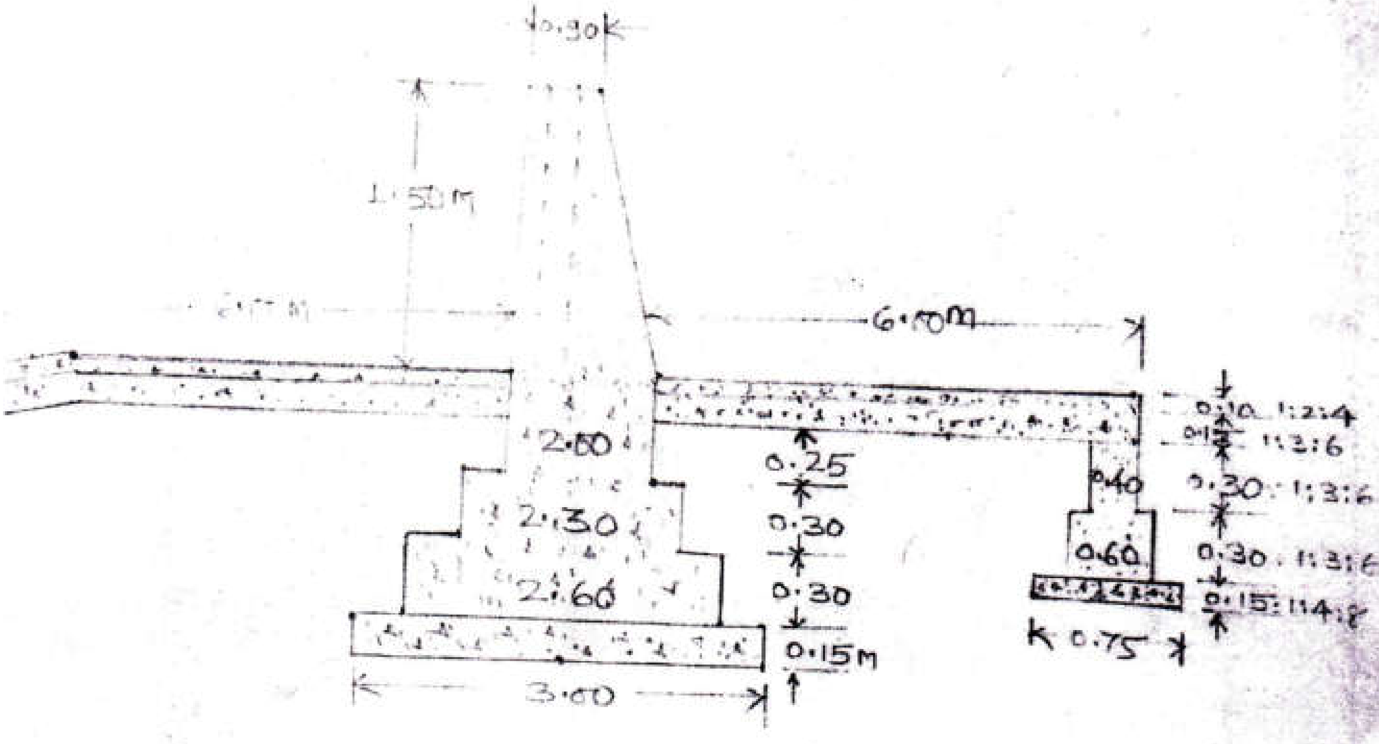
RATE ANALYSIS

Item: Filling local available soil for vegetative bund including planting of nearby available vegetation to protect erosion of soil cost of T & P and labour charges as per instruction of engineer-in-charge.

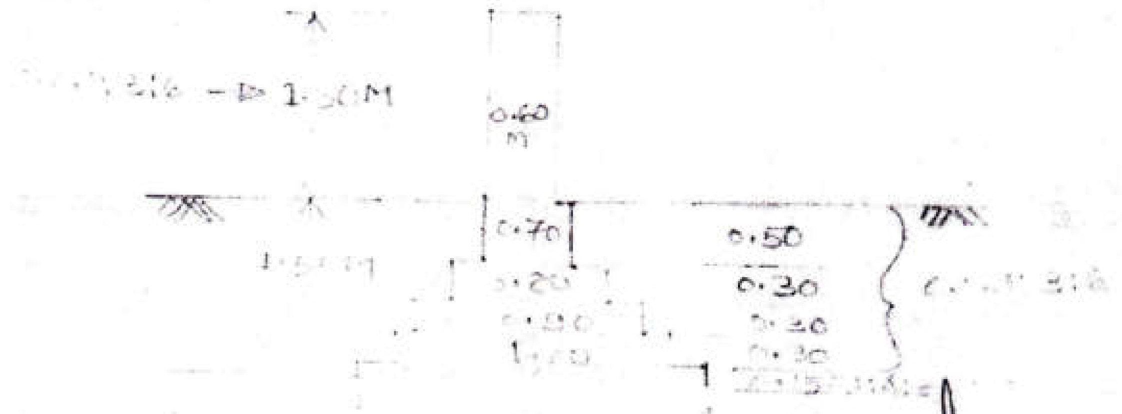
UNIT: 10.00 cum

labour for filling of soil (unskilled)	2.50 nos. @ Rs. 499.80/e	= 1249.50
labour for planting of local available vegetation(unskilled)	1 no. @ Rs. 499.80/e	= 499.80
Mate	0.25 no. @ Rs. 585.48/e	= 146.37
		1895.67
Add water charges 1%		= 18.95
		1914.62
Add contractor's profit 15%		= 287.19
Cost of 10.00 cum		= 2201.81
Cost as of per cum		= 220.18

AHQ GUWAHATI AREA



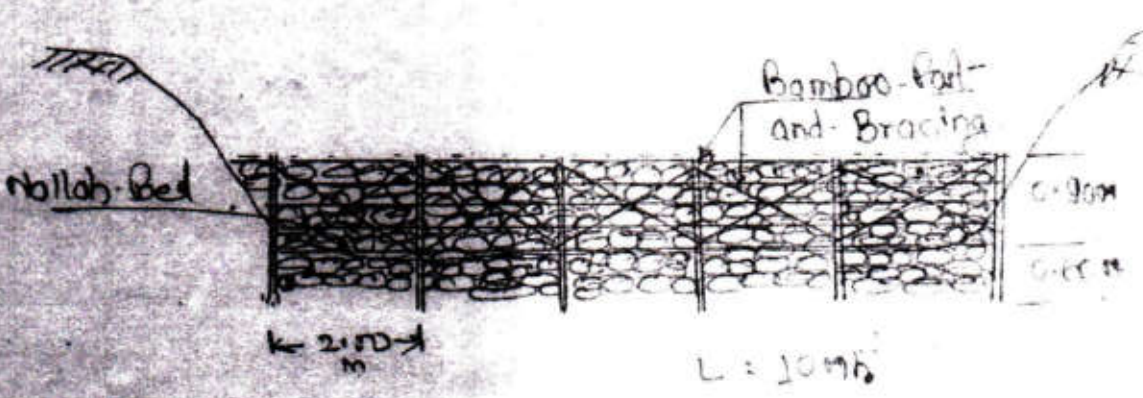
CROSS SECTION OF CHECKDAM.



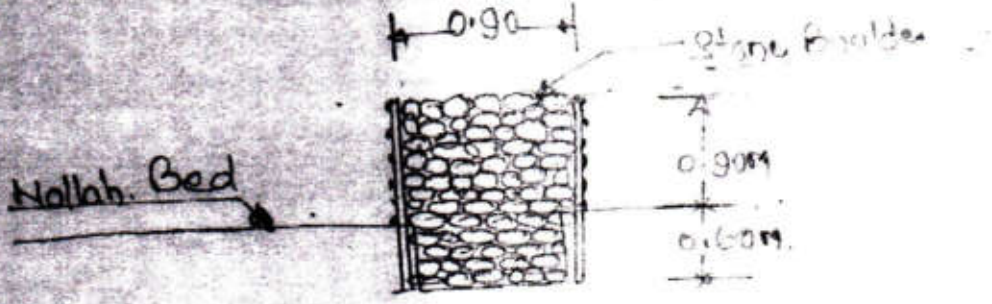
1.9.20
SOB(C)

11

Detail drawing of Nallah Bund, Kishtwar



L- Section of Nallah Bund.



Cross Section of Nallah Bund.

4/9/20

9.20
SDE(C)

ANNEX I

F. No. 8-41/2017-FC
Government of India
Ministry of Environment, Forests & Climate Change
(Forest Conservation Division)
****

Indira Paryavaran Bhawan,
Jor Bagh Road, Aliganj,
New Delhi: 110003,
Dated: 27th September, 2017

To,

The Principal Secretary (Forests),
Government of Chhattisgarh,
Raipur.

Sub: Diversion of 112.385 ha of Revenue forest land for Gevra Open Cast Mine (OCM) in Katghora Forest range, District –Korba Chhattisgarh in favour of SECL, Chhattisgarh.

Sir,

I am directed to refer to the Government of Chhattisgarh's letter No. F-5-12/2017/10-2 dated 01.05.2017 on the subject mentioned above seeking prior approval of the Central Government under Section-2 of the Forest (Conservation) Act, 1980 and to say that the proposal has been examined by the Forest Advisory Committee constituted by the Central Government under Section-3 of the aforesaid Act.

After careful examination of the proposal of the State Government and on the basis of the recommendations of the Forest Advisory Committee, ***In-principle approval /Stage-I Clearance*** of the Central Government is hereby granted for diversion of 112.385 ha of Revenue forest land for Gevra Open Cast Mine (OCM) in Katghora Forest range, District –Korba Chhattisgarh in favour of SECL, Chhattisgarh subject to the following conditions:

(i) Legal status of the diverted forest land shall remain unchanged;

(ii) Compensatory Afforestation shall be done over degraded forest land twice in extent to the forest area proposed to be diverted within a period of three years with effect from the date of issue of Stage-II clearance and maintained thereafter in accordance with the approved Plan in consultation with the State Forest Department at the cost of the user agency. At least 1000 saplings per hectares shall be planted over 224.77 ha (224770 plants). If this is not possible to plant these many seedlings in the identified DFL, the balance seedlings will be planted in other suitable degraded forest land as per the prescriptions of the Working Plan at the cost of the User agency. In such case CA cost will be revised and duly approved by competent authority and deposited online in the CAF managed by CAMPA. 25% of the CA cost additionally will be spent towards Soil and Moisture Conservation activities in the proposed CA area as per site requirement and deposited in CAF.

(iii) **On examination of Compensatory afforestation land on Google Satellite Imagery and DSS tools, it is found that 30 ha area is having dense vegetation and 53 ha land seems to be under encroachment. State Government shall exclude the land under encroachment and under very dense vegetation from the proposed CA area and additional degraded forest land which is free from encumbrances/encroachment and degraded shall be selected prior to stage II approval. The land shall be analysed through DSS at state level prior to submission to MoEF&CC for consideration. State Government shall submit DSS analysis report along with the compliance of this condition.**

(iv) State Government shall reconfirm the enumeration list of trees prior to stage II approval.

27.9.17

(v) The User Agency shall ensure that construction of residential accommodation for workers will be undertaken separately on non-forest land to avoid pressure on forest land for temporary construction.

(vi) Safety zone shall be fenced with coiled barbered wire fencing of 6 feet high for the protection of forests;

(vii) Safety zone along the lease boundary, shall be implemented by the User Agency in accordance with the guidelines issued by the MoEF&CC in this regard;

(viii) Encroachment from the lease area of the User Agency should be evicted and in case eligible claimants are found in the area proposed for diversion, they should be rehabilitated as per the R&R policy of the State Government of Chhattisgarh in consonance with the National R&R policy.

(ix) The user agency should undertake comprehensive greening in the villages located in the surrounding of their lease area.

(x) Mined out forest area already reclaimed by the User Agency, should be handed over back to the State Forest Department with a view to bring it under the ambit of core forestry management.

(xi) The UA should prepare a land surrender schedule for surrender of the mined out and biologically reclaimed forest land in accordance with the existing mine plan irrespective of progressive mine closure plan and submit an surrender schedule and an undertaking that mined out and biologically reclaimed forest land will be surrendered to the State Forest Department as per this schedule. No further change in the schedule for surrendering of forest land should be allowed.

(xii) With a view to enrich the water regime in the area, a comprehensive Catchment Area Treatment Plan in the area to arrest flow of silt in the Hasdeo River and to improve water regime should be implemented at the project cost;

(xiii) A study should be undertaken at the project cost to assess the impact of intervention undertaken by the SECL, in consultation with the State Forest Department, for the protection, conservation and development of wildlife in the area. Based on the outcome of such study, the measures for protection, conservation and development of the wildlife, if needed may further be strengthened at the project cost.

(xiv) No forest land should be used for undertaking the diversion of district road, bifurcating the Revenue forest land proposed to divert by the User Agency. While undertaking diversion of the said road, the User Agency should select such alignment ensuring that accessibility/connectivity is maintained at the ease of the local residents.

(xv) It is reported that the user agency had biologically reclaimed 404.8 ha of land. A subcommittee of FAC under the chairmanship of Sh. Deepak Sinha IG(FC) , Sh. R.K. Dey APPCF regional office Bhuvneshwar and Sh. Sandeep Sharma AIG(FC) shall visit the site and submit report on the status of biologically reclaimed area to MoEF and CC .

(xvi) The land identified for the purpose of CA shall be clearly depicted on a Survey of India topo-sheet of 1:50,000 scale;

(xvii) The User Agency shall transfer the cost of raising and maintaining the compensatory afforestation at the current wage rate in consultation with State Forest Department in the account of Ad-hoc CAMPA of the concerned State through online portal. The scheme may include appropriate provision for anticipated cost increase for works scheduled for subsequent years.

(xviii) The User Agency shall transfer the funds for the Net Present Value (NPV) of the forest land being diverted under this proposal from the User Agency as per the orders of the Hon'ble Supreme Court of India dated 28.03.2008, 24.04.2008 and 09.05.2008 in Writ Petition (Civil) No. 202/1995 and the guidelines issued by this Ministry vide its letter No. 5-3/2007-FC dated 05.02.2009 through online portal of Ad-hoc CAMPA account of the State Concerned;

(xix) At the time of payment of the Net Present Value (NPV) at the present rate, the user agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India;

27.9.17

(xx) Any fund received from the user agency under the project, except the funds realized for regeneration/ demarcation of safety zone, shall be transferred to Ad-hoc CAMPA through online portal of Ad-hoc CAMPA account of the State Concerned;

(xxi) Following activities shall be undertaken by the user agency at the project cost and appropriate cost of the plan/scheme shall be deposited in Ad-hoc CAMPA Account:

(a) A plan containing appropriate mitigative measures to minimize soil erosion and choking of streams shall be prepared and implemented;

(b) Planting of adequate drought hardy plant species and sowing of seeds in the appropriate area within the mining lease to arrest soil erosion;

(c) Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour;

(d) Stabilize the overburden dumps by appropriate grading/benching so as to ensure that that angles of repose at any given place is less than 28°; and

(e) Strict adherence to the prescribed top soil management.

(xxii) User agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986;

(xxiii) User agency in consultation with the State Forest Department shall create and maintain alternate habitat/ home for the avifauna, whose nesting trees are to be cleared in this project. Bird nests artificially made out of eco-friendly materials shall be used in the area, including forest area and human settlements, adjoining the forest area being diverted for the project;

(xxiv) Fencing, protection and regeneration of the safety zone area [7.5 meters strip shall be kept within the mining lease boundary and area of the safety zone shall be part of the total area of mining lease as per the Ministry's guidelines dated 27.05.2015] shall be done at the project cost within three years and maintained thereafter as per approved working plan of the State Govt. Besides this afforestation on degraded forest land to be selected elsewhere measuring one & a half times the area under safety zone shall also be done at the project cost;

(xxv) User agency either himself or through the State Forest Department shall undertake afforestation on degraded forest land, one and half time in extent to the area used for safety zone;

(xxvi) Period of diversion of the said forest land under this approval shall be for a period co-terminus with the period of the mining lease proposed to be granted under the Mines and Minerals (Development and Regulation) Act, 1957, and the Rules framed there-under as amended;

(xxvii) User agency either himself or through the State Forest Department shall undertake gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.4), if any, located in the area within 100 meters from outer perimeter of the mining lease;

(xxviii) The User Agency shall prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km. from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency shall regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such tanks/water bodies. A detailed plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF & CC before Stage-II approval;

(xxix) User agency shall undertake mining in a phased manner and take due care for reclamation of the mined over area. The concurrent reclamation plan shall be executed by the User Agency as per the approved mining plan/scheme and an annual report on implementation thereof shall be submitted to the Nodal Officer, Forest (Conservation) Act, 1980, Government of Odisha and the Addl. Principal Chief Conservator of Forests (Central), Ministry of Environment & Forests, Regional Office (Eastern Zone), Bhubaneswar. If it is found from the annual report that the activities indicated in the concurrent reclamation

27.9.17

plan are not being executed by the user agency, the Nodal Officer or the Addl. Principal Chief Conservator of Forests (Central) may direct that the mining activities shall remain suspended till such time, such reclamation activities are satisfactorily executed;

(xxx) No labour camp shall be established on the forest land;

(xxxi) User agency shall provide firewood preferably alternate fuel to the labourers and the staff working at the site so as to avoid any damage and pressure on the adjacent forest areas;

(xxxii) Boundary of the mining lease and safety zone shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, forward and back bearing, distance from pillar to pillar and GPS co-ordinates;

(xxxiii) Forest land shall not be used for any purpose other than that specified in the proposal;

(xxxiv) State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence as prescribed by this Ministry vide their letter No. 11-9/1998-FC (pt.) dated 3rd August 2009 read with 05.07.2013, in support thereof;

(xxxv) The user agency shall submit the annual self compliance report in respect of the above conditions to the State Government, concerned Regional Office and this Ministry by the end of March every year regularly.

(xxxvi) Any other condition that the Regional Office (Western Zone), Bhopal of this Ministry, may stipulate, from time to time, in the interest of conservation, protection and development of forests & wildlife; and

(xxxvii The State Government and user agency shall comply the provisions of the all Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project.

After receipt of compliance report on fulfilment of the conditions mentioned above, the proposal shall be considered for final approval under Section-2 of the Forest (Conservation) Act, 1980. Transfer of forest land shall not be affected till final approval is granted by the Central Government in this regard.

Yours faithfully,

(Sandeep Sharma) 27.9.17
Assistant Inspector General of Forests (FC)

Copy to:-

1. The Principal Chief Conservator of Forests, Government of Chhattisgarh, Raipur.
2. The Addl. PCCF (Central), Regional Office, Nagpur
3. The Nodal Officer, the Forest (Conservation) Act, 1980, of Chhattisgarh, Raipur.
4. User Agency.
5. Forest Conservation Monitoring Cell, FC Division, MoEF&CC, New Delhi.
6. Guard File.

(Sandeep Sharma) 27.9.17
Assistant Inspector General of Forests (FC)

ANNEX 2

सत्यमेव जयते

No. J-11015/85/2010-IA.II(M)
Government of India
Ministry of Environment, Forest and Climate Change
Impact Assessment Division
****

Indira Paryavaran Bhavan,
Jor Bagh Road, New Delhi-110 003

Dated: 4th ~~April~~ JUNE, 2020

To,

Chairman and Managing Director,
M/s South Eastern Coalfields Ltd,
W B P & Environment Department,
Seepat Road, P B. No.60
Bilaspur - 495 006 (Chhattisgarh) Email: gmenvtsecl@gmail.com;

Sub: Expansion/Continuation of Gevra Opencast Coal Mine from 41 MTPA to 45 MTPA in ML area of 4184.486 ha of M/s South Eastern Coalfields Limited at district Korba (Chhattisgarh) – Continuation of Environmental Clearance -reg.

Sir,

This has reference to your online proposal No. IA/CG/CMIN/19281/2013 dated 3rd May, 2019 on the above-mentioned subject.

2. The Ministry of Environment, Forest and Climate Change has considered the proposal for extension/continuation of environmental clearance dated 28th March, 2019 to the Expansion of Gevra Opencast Coal Mine from 41 MTPA to 45 MTPA in ML area of 4184.486 ha of M/s South Eastern Coalfields Limited at district Korba (Chhattisgarh), for a period of one year and subject to compliance of certain terms and conditions, which *inter-alia* included the following and other conditions:-

"Subject to the review of the compliance status of the conditions by the EAC to consider continuance of the project after one year".

3. In line with the above condition, Project Proponent submitted the compliance of all the specifics conditions. Site inspection was carried out by Regional Office, Nagpur on 25th December, 2019 to monitor the status of compliance of conditions stipulated in the environmental clearance dated 28th March, 2019 and certified compliance report was submitted vide its letter dated 14th January, 2020. Action Taken Report over Certified Compliance Report submitted to RO, MoEF&CC (Nagpur) on 21st January, 2020. Action Taken Report over Certified Compliance Report forwarded by RO to MoEF&CC, New Delhi vide letter No:3-28/2014(ENV)Pt/6174 Dtd: 4th February, 2020

4. The proposal was considered by the sectoral Expert Appraisal Committee (EAC) in its meeting held on 20th February, 2020 and recommended for continuance of the project and validity of environmental clearance dated 28th March, 2019 for a period of 30 years or life of the mine, whichever is earlier subject to the terms and conditions stipulated therein remaining the same and with additional conditions. Further regarding proposal of expansion from 45 MTPA to 49 MTPA, EAC observed that the decision on further expansion upto 49

MTPA may be taken later based on the final outcome of the proposed studies and other compliance etc. Also, PP needs to focus more on the compliance of partially compliant EC conditions. Based on the recommendation of the EAC, the Ministry of Environment, Forest and Climate Change hereby accords approval for the **continuance of the Environment Clearance(EC) for expansion** of Gevra Opencast Coal Mine from 41 to 45 MTPA in ML area of 4184.486 ha of M/s South Eastern Coalfields Limited at district Korba (Chhattisgarh), for a period of 30 years or life of the mine, whichever is earlier, under the provisions of the Environment Impact Assessment Notification, 2006 and subsequent amendments/circulars thereto subject to the compliance of additional as under:-

(i) EAC desired that the MoC may direct CIL subsidiaries to comply the EC/FC/CTO conditions strictly within certain time bound manner so that the mining operations will be environmentally sustainable/viable etc.

(ii) Also, EAC asked project proponent to plant 50,000 nos. of native trees (excluding other conditions of plantation given by this Ministry) with broad leaves along the villages and transportation route to prevent the effect of air pollution in three years. After completion of tree plantation, number of trees shall be duly endorsed from District Forest Office.

(iii) All Partially and non-complied conditions (if any) reported by Ministry's Regional Office in its certified compliance report dated 14th January, 2020 shall be completed in 2 years from the date of issue of this letter.

(iv) Final recommendation/outcome of the study on ecosystem carrying capacity by IIT-BHU and the study on catchment area treatment plan within 5 KM from mine lease boundary by CCOST shall be implemented in certain timeframe. PP shall submit action plan with timelines to the Ministry's Regional Office for implementation of the recommendations.

(v) Fixed water sprinklers shall be installed on haul roads for suppression of dust.

(vi) The activities and fund provisions for CER shall be made as per the guidelines issued by the Ministry regarding CER on 1st May, 2018

(vii) Active OB dump should not be kept barren/open and should be covered by temporary grass to avoid air born of particles.

(viii) The Project Proponent shall comply with all the statutory requirements and judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ Petition (Civil) No. 114

of 2014 in the matter of Common Cause versus Union of India and Ors. State Government shall ensure that the entire compensation levied, if any, for illegal mining paid by the Project Proponent through their respective Department in strict compliance of judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India and Ors.

(ix) Project Proponent shall obtain the necessary prior permission from the Central Ground Water Authority (CGWA) in case of intersecting the Ground water table. The intersecting ground water table can only be commencing after conducting detailed hydrogeological study and necessary permission from the CGWA. The Report on six monthly bases on changes in Ground water level and quality shall be submitted to the Regional Office of the Ministry, CGWA and State Pollution Control Board.

(x) Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the Project and maintain records accordingly; also, Occupational health check-ups for workers having some ailments like BP, diabetes, habitual smoking, etc. shall be undertaken once in six months and necessary remedial/preventive measures taken accordingly. The Recommendations of National Institute for ensuring good occupational environment for mine workers shall be implemented; The prevention measure for burns, malaria and provision of antisnake venom including all other paramedical safeguards may be ensured before initiating the mining activities.

(xi) Project Proponent shall follow the mitigation measures provided in Office Memorandum No. Z-11013/57/2014-IA.II (M), dated 29th October, 2014, titled "Impact of mining activities on Habitations-Issues related to the mining Projects wherein Habitations and villages are the part of mine lease areas or Habitations and villages are surrounded by the mine lease area".

(xii) The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the villages is not disturbed; by orienting the floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limits for day light/night hours.

(xiii) The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna, if any, spotted in the study area.

Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Department. A copy of action plan shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office.

(xiv) Hon'ble Supreme Court in an Writ Petition(s) Civil No. 114/2014, Common Cause vs Union of India & Ors vide its judgement dated 8th January, 2020 has directed the Union of India to impose a condition in the mining lease and a similar condition in the environmental clearance and the mining plan to the effect that the mining lease holders shall, after ceasing mining operations, undertake re-grassing the mining area and any other area which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna etc. Compliance of this condition after the mining activity is over at the cost of the mining lease holders/Project Proponent". The implementation report of the above said condition shall be sent to Regional Office of the Ministry. Further, the outcomes of various court cases pending in various courts shall also be applicable/enforceable along with the conditions of this EC.

5. All other terms and conditions stipulated in the Environment Clearance (EC) dated 21st February, 2018 and 28th March 2019 shall also be applicable.

4.6.20

(Manoj Kumar Gangeya)
Director

Copy to:

1. The Secretary, Ministry of Coal, Shastri Bhawan, New Delhi
2. The APCCF, Ministry of Environment Forest and Climate Change, Regional Office (Western Central Zone), Ground Floor, East Wing, New Secretariat Building Civil Lines, Nagpur (Maharashtra)
3. The Secretary, Department of Environment & Forests, Government of Chhattisgarh, Secretariat, Raipur
4. The Member-Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi
5. The Member Secretary, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, New Delhi - 32
6. The Member Secretary, Chhattisgarh State Environment Conservation Board, 1-Tilak Nagar, Shiv Mandir Chowk, Main Road, Avanti Vihar, Raipur - 492001 (Chhattisgarh)
7. The District Collector, Korba, Government of Chhattisgarh.
8. Monitoring File 9. Guard File 10. Record File 11. Notice Board

(Manoj Kumar Gangeya)
Director

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(Manoj Kumar Gangeya)
Director

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3. The Secretary, Department of Environment & Forests, Government of Chhattisgarh, Secretariat, Raipur
4. The Member-Secretary, Central Ground Water Authority, Ministry of Water Resources, Curzon Road Barracks, A-2, W-3 Kasturba Gandhi Marg, New Delhi
5. The Member Secretary, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, New Delhi - 32
6. The Member Secretary, Chhattisgarh State Environment Conservation Board, 1-Tilak Nagar, Shiv Mandir Chowk, Main Road, Avanti Vihar, Raipur - 492001 (Chhattisgarh)
7. The District Collector, Korba, Government of Chhattisgarh.
8. Monitoring File 9. Guard File 10. Record File 11. Notice Board

(Manoj Kumar Gangeya)
Director

ANNEX 3

SEEPAT ROAD
P.O.: SECL
BILASPUR

साउथईस्टर्नकोलफिल्डस्लिमिटेड
South Eastern Coalfields Limited
(कोलइण्डियाकाएकअंग/A subsidiary of Coal India Ltd.)
CIN U10102CT1985GO1003161
Website : www.secl.gov.in
कार्यालय: महाप्रबंधक, गेवरा क्षेत्र
OFFICE OF THE GENERAL MANAGER
GEVRA AREA

STD :07815 275430(O)
:07815 275032(R)
Fax : 07815 275434
email noenvgevra@gmail.com

पो0आ0:गेवराप्रोजेक्ट
जिला: कोरबा(छत्तीसगढ़)
पिन:495452

P.O.: GEVRA PROJECT
Distt.: Korba (C.G.)
Pin: 495452

क्रमांक/एस.ई.सी.एल/मप्र/गे.क्षे./ पर्यावरण/2018 / 259 दिनांक23/03/18

WORK ORDER

TO
The Director General
Chhattisgarh Council Of Science & Technology
Govt. Of Chhattisgarh, Raipur

SUB: Award of Work for Preparation of Comprehensive Catchment Area Treatment in respect of Gevra Open Cast Project SECL (CG).

REF: Your Letter no. 2950/CCOST/2017 DT: 12.12.2017

Dear Sir

With reference to the above this is to communicate to you the approval of competent authority to award the subject work to Chhattisgarh Council Of Science & Technology (CCOST), Raipur amounting to Rs. 1200861/- (Twelve lakhs and eight hundred and sixty one only) inclusive of all taxes on the terms & conditions as indicated below with the following scope of work.

SCOPE OF WORK

1. The problem of silt and debris load to river from the susceptible areas of the catchment.
2. Checking the sediment load from the tributaries directly discharging into the river.
3. Protecting the directly draining catchment from scouring / sloughing.
4. Mitigative measures for the erosion and other hazards resulting from the project activities.

WORK ELEMENTS

1. **Estimation of soil erosion**
   a. Study of drainage pattern of the catchment area

24/3/18

b. Delineation of watersheds and sub-watersheds of free draining catchment.

c. Assessment of slope of the catchment area

d. Land use and land cover mapping using remote sensing and GIS

e. Study of soil parameters under directly draining area

f. Study of soil details, silt yield and its delivery potential

2. Prioritization of Sub-watersheds

a. Preparation of a framework of sub-watersheds

b. Generation of a map indicating erosion-intensity

c. Assignment of weightage values to various mapping units

d. Assignment of maximum delivery ratios to various erosion intensity mapping units and assessment of adjusted delivery ratios for different sub-watersheds.

e. Computing Silt-Yield Index for individual sub-watersheds

f. Grading of sub-watersheds for prioritization

3. Identification of area for Comprehensive Area Treatment.
4. Preparation of Schedule of Implementation

TERMS & CONDITIONS

1. Total value of the work is Rs. 1200861/- (Twelve lakhs and eight hundred and sixty one only) inclusive of all taxes.
2. 50% amount will be released as an advance payment. The advance amount will be released on receipt of pre receipted bill from your end. Balance 50% will be released after submission of study report.
3. The Date of commencement of work shall be reckoned from date of acceptance of work order.
4. The copy of work order duly accepted on its body be sent back as a token of acceptance of the same.
5. The period of completion of work will be 120 days.
6. The report shall be submitted in 6 copies and soft copy to General Manager Gevra Area.
7. The proposal has been financially concurred vide FC/GVR/C/FL/17-18/27 DT: 17.03.2018 and BC/GVR/C/FL/17-18/62 and paying authority will be Area Finance Manager, Gevra SECL.

You are requested to contact Assistant Manager (ENVT.) 9425282479, Gevra Area to start the work and its early completion.

Yours Faithfully

23/3/18

Nodal Officer (Envt./ Forest)
SECL Gevra Area

SEEPAT ROAD
P.O.: SECL
BILASPUR

साउथईस्टर्नकोल्डफिल्डलिमिटेड
South Eastern Coalfields Limited
(कोलइंडियाकाएकअंगत/A subsidiary of Coal India Ltd.)
CIN U10102CT1985GOI003161
Website : www.secl-cil.in
कार्यालय: महाप्रबंधक,गेवरा क्षेत्र
OFFICE OF THE GENERAL MANAGER
GEVRA AREA

STD :07815 275430(O)
: 7815 275032(R)
Fax :07815 275434
email :gevraenvt@gmail.com

पो0आ0:गेवराप्रोजेक्ट
जिला: कोरबा(छत्तीसगढ़)
पिन:495452

P.O. : GEVRA PROJECT
Distt.: Korba (C.G.)
Pin: 495452

क्रमांक/एस.ई.सी.एल/मप्र/गे.क्षे./ पर्यावरण/2021 / 245 दिनांक 03/11/2021

वचन पत्र

गेवरा खुली खदान 112.385 हे0 वन भूमि परिवर्तन के लिये Catchment Area Teatment Plan हेतु वनमण्डलाधिकारी कटघोरा के पत्र कमाक/तक.अधि./2021/6065 कटघोरा दिनांक 20.10.2021 के द्वारा रु. 8447900/–(चौरासी लाख सैतालिस हजार नौ सौ रुपये मात्र) का डिमांड नोट दिया गया था। उक्त राशि का भुगतान ई चालान जनरेट कर कैम्पा फंड में जमा कर दी गई है, भविष्य में किसी प्रकार की अन्तर की राशि देने हेतु साउथ ईस्टर्न कोल फील्ड्स लिमिटेड गेवरा क्षेत्र, वचन बद्ध है।

एस.के.मोहन्ती 3/11/21
महाप्रबंधक
General Manager
एस.ई.सी.एल., गेवरा क्षेत्र
SECL, Gevra Area

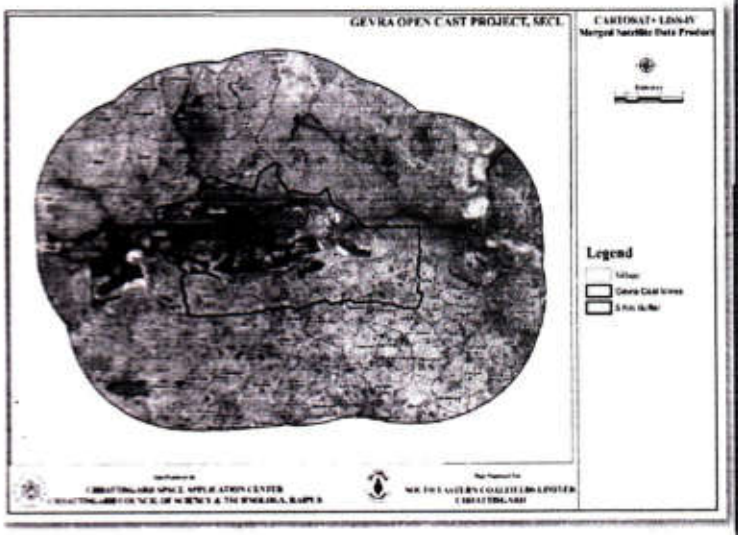
For Official use only

A REPORT ON CATCHMENT AREA TREATMENT PLAN USING REMOTE SENSING AND GIS

GEVRA AREA OF SOUTH EASTERN COALFIELDS Ltd, DISTRICT KORBA CHHATTISGARH STATE

ACTION PLAN REPORT

SURFACE DRAINAGE PLAN WITH SURFACE WATER CONSERVATION PLAN FOR GEVRA EXPANSION PROJECT



Submitted by:

CHHATTISGARH COUNCIL OF SCIENCE & TECHNOLOGY, CHHATTISGARH SPACE APPLICATIONS CENTRE,
VIGYAN BHAVAN, VIDHANSABHA ROAD,
RAIPUR (CG) 492 014

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Preamble

Effective utilization of natural resources and their management is essential for the growth and development of any economy. This requires systematic planning so that development issues do not come in the way of environmental considerations. Keeping the environmental issues in mind while planning is the most crucial ingredient for any development planning. Reliable and timely information on resources is pre-requisite for the mining development of a plan.

Various central and state departments are involved in the process of monitoring the Environmental impact of anthropogenic activities. Information on natural resources when viewed on a Satellite Data gives a synoptic view of the area of interest and thematic interpretation is possible to identify areas that need specific attention for initiating conservation measures.

GIS and Remote Sensing over the years have served a useful tool for decision support. Most of the information is not available in the form that they can be directly depicted spatially over various other layers. This information is mostly available in tabular format and spread over many departments. GIS and Remote Sensing allows us to transform information from various sources to one platform and enables decisions or planning exercises in a scientific and timely manner for the benefit of the target group.

The Council has established Chhattisgarh Space Applications Centre to monitor the States natural resources. The CGSAC has been established:

a. To carry out all work related to Remote Sensing Applications and GIS for the State of Chhattisgarh.

b. To carry out work related to Satellite Communications for Training, Education and Health, etc. for the State of Chhattisgarh.

c. To take up the National projects within the State as well as outside the State.

The CGSAC also promotes training in Remote Sensing/GIS technology for the various line departments and students & faculty members of various Universities and colleges to popularize the techniques.

Chhattisgarh Space Applications Centre of Chhattisgarh Council of Science and Technology over the years has built in-house capacity to take-up tasks that are information intensive and require scientific data interpretation skills for natural resource mapping and GIS database creation. CGSAC of the council has well trained team of Senior Scientists to undertake this task.

1. Technical Proposal

South Eastern Coalfields Ltd (SECL) approached the Council to provide technical support and provide relevant inputs for the preparation of forest clearance and environment clearance proposals. Remote Sensing and GIS based inputs are required for the preparation of a comprehensive catchment area treatment plan in the area to arrest flow of silt in the Hasdo River and to improve water regime.

1.1. Study area

The proposed study area of SECL lies in the Korba District of the State. As per the boundary information provided to the Council the GIS area of the Gevra project area is estimated to be 4,731 Ha. the SECL Gevra lease area 70MTY has been informed to be 4781.798 Ha. It was also informed that the study is to be carried out for the 5Km buffer of the Gevra project boundary; the area within 5 km buffer is estimated to be 27,927 Ha.

It is also to inform here that the GIS area is based on the Ortho Rectified Satellite Images only and no DGPS survey was carried out for this purposed by the Council. This GIS area could vary from the actual area under lease. The area differences may be due to standard map projections adopted (WGS84, UTM) in this study and the field measured area could be topographic area.

Based on the area information provided SECL with the 5 Km. Buffer is plotted on the State boundary and is shown in Figure 1-1.

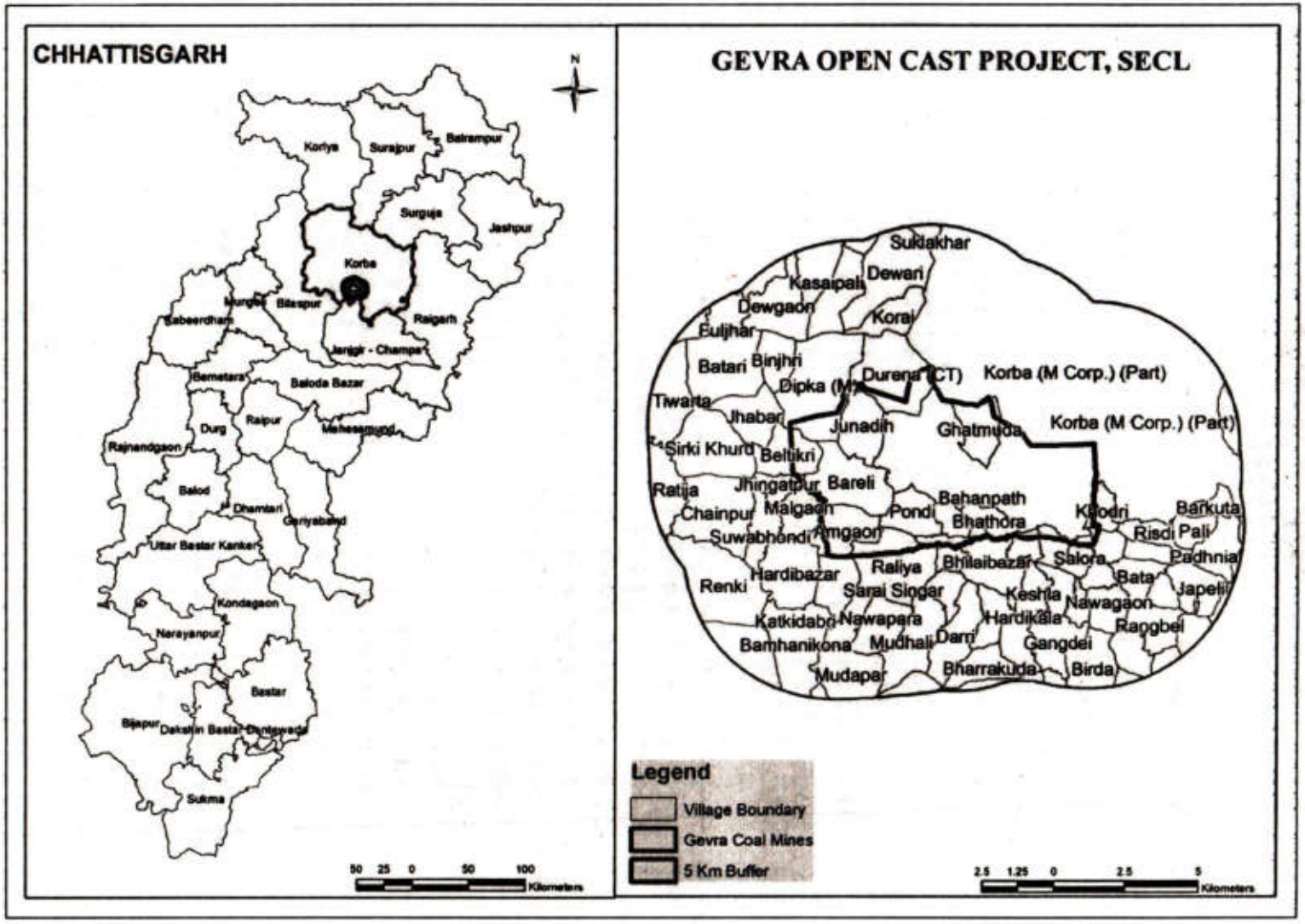

Figure 1-1 Regional Location of SECL Project Area

1.2. Scope of the work

The Scope of the work indicated by the SECL vide letter no. एस.ई.सी.एल/म.प्र/गे.क्षे/. पर्यावरण/ 2018/259 dated 23/03/18 is as under:

The study to be carried out by the council should enable the South Eastern Coalfields Ltd. to address the issues:

1. The problem of silt and debris load to river from the susceptible areas of the catchment based on Universal Soil Loss Equation (USLE) and field observation.
2. Checking the sediment load from the tributaries directly discharging into the river.
3. Protecting the directly draining catchment from scouring / sloughing
4. Mitigative measures for the erosion and other hazards resulting from the project activities

After carefully going through the requirements, Council proposes to process and generate the following maps to meet the requirements of SECL:

1. Rectification & Geo Coding of High Resolution
2. Satellite data based interpretation of Geology.
3. Overlay of Geological Structures on the Geology map.
4. Landuse/landcover of the area
5. Geomorphological setup
6. Slope
7. Drainage network
8. Surface waterbody
9. Infrastructure facilities including details of existing features:
    a. Road
    b. Rail
    c. Settlement locations
10. Village boundary with 2011 census based socio-economic profile
11. Forest & Cadastral information.
12. Action plan for soil and water conservation

1.3. Work Elements

Council's proposal against each of the work element indicated by SECL are enumerated below for getting technical consent from SECL:

Sl	As indicated by SECL Ltd.	Council's Proposal	Remarks
1	**Estimation of soil erosion**	Council proposes to use Universal Soil Loss Equation to identify and delineate areas that are prone to erosion	Widely used in erosion related research studies.
a	**Study of drainage pattern of the catchment area**	Council shall create drainage network map from Survey of India toposheets and High Resolution satellite images created under SIS-DP project	Standard procedure adopted in GIS studies
b	**Delineation of watersheds and sub-watersheds of free draining catchment**	Council shall use the National Atlas of Watersheds published by National Bureau of Soil Survey an Landuse Survey as standard base and subdivide the published watershed boundaries into smaller manageable Micro, Mini, Milli -watersheds	Standard procedure adopted in GIS studies
c	**Assessment of slope of the catchment area**	Council shall generate slope from the DEM generated from the CARTOSAT – 1 Stereo images	Slope based on DEM at 10 mts. Posting is available.
d	**Land use and land cover mapping using remote sensing and GIS**	Council shall create landuse/landcover map of the entire study area. Using existing satellite images and 10 mts pixel images available in free domain. (SECL provided boundary) As per initial estimated the GIS areas of the mine is = 4,731 Ha. And the 5 km buffer of the boundary amounts to = 27,927 Ha)	The boundary provided by SECL has been used and a buffer of 5 kms shall be created.
e	**Study of soil parameters under directly draining area**	Council has soil physiographic class maps of the study area, which would be provided as deliverables.	Not fresh mapping required.
f	**Study of soil details, silt yield and its delivery potential**	Council proposes to use Universal Soil Loss Equation to identify and delineate areas that are prone to erosion	Widely used in erosion related research studies.

Sl	As indicated by SECL Ltd.	Council's Proposal	Remarks
2	**Prioritization of Sub-watersheds**	Based on the intensity in erosion the watersheds shall be prioritized	-
a	**Preparation of a framework of sub-watersheds**	The framework shall be based on the enumeration at point no. 1b	No separate effort is required
b	**Generation of a map indicating erosion-intensity**	Council shall generate erosion-intensity map based on the results of the processing enumerated at 1f	Output maps shall be presented on A3 paper with the final report.
c	**Assignment of weightage values to various mapping units**	Council shall use the landuse/ landcover, soil and erosion intensity maps as input to derive Prioritization of watersheds	As adopted in multi criteria analysis in GIS.
d	**Assignment of maximum delivery ratios to various erosion intensity mapping units and assessment of adjusted delivery ratios for different sub-watersheds**	As universal soil loss equation shall be used, the outputs should suffice the present need	Not fresh analysis will be carried out.
e	**Computing Silt-Yield Index for individual sub-watersheds**	As universal soil loss equation shall be used, the outputs should suffice the present need	Not fresh analysis will be carried out.
f	**Grading of sub-watersheds for prioritization**	As indicated in 2c	-
3	**Identification of area for Comprehensive Area Treatment**	As indicated in 2c	-
4	**Preparation of Schedule of Implementation**	Council shall generate a suggestive action plan map of the 27,927 Ha study area.	-

Sl	As indicated by SECL Ltd.	Council's Proposal	Remarks
5	**Preparation of treatment measures and their cost estimate**	Actual engineering design of each structure and their costing shall be prepared by SECL/officers of irrigation departments	Beyond the Council's purview

For the above, South Eastern Coalfields Ltd. provided work order to the council.

1.4. Methodology Adopted

As per the needs identified in Section 1, Council proposes following methodology:

1.5. Satellite data Processing

Council shall process the CARTOSAT and suitable LISS-IV satellite data so as to enable 1:10,000 scale mapping of the feature in the 5 Km. Buffer of SECL area. The total area to be mapped is estimated to be about 238.279 Sq.Km (27,927 Ha.). The area of interest (27,927 Ha) falls in one RESOURCESAT-1, LISS-IV Mx scenes and three CARTOSAT-1 scenes. Figure 1-2 shows the SECL area with 5 Km. buffer and satellite data foot prints.

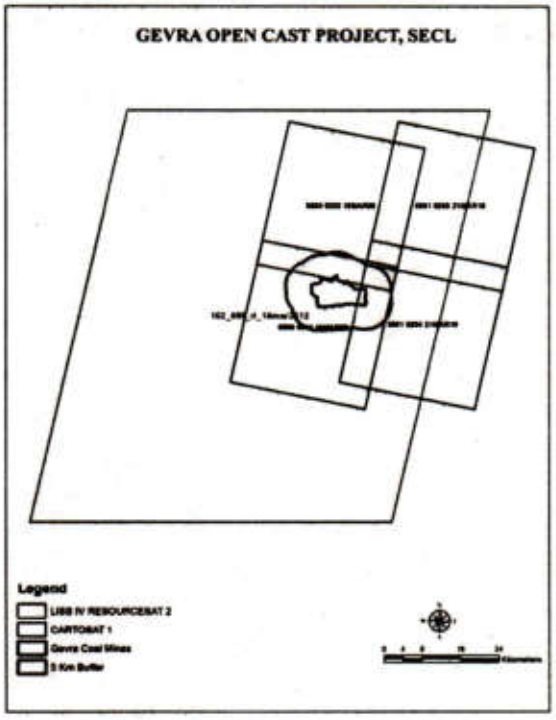

Figure 1-2 SECL Area location with Satellite Data Footprints

1.6. Outputs

Deliverables of this project will be:

1. Soft copy of Rectified & Geo-referenced Fused multi spectral (FCC) with 2.5 mt. resolution satellite data of the study area in **geotiff format** on CD/DVD.
2. Hard copy colour prints of Map compositions of satellite data and Thematic mapping (as per sections 1.2 and 0 above) of features on A3 Size paper (on best fit scale) with proper annotations, legend and scale information.
    - Geology & Geological Structures, Landuse/landcover, Geomorphological setup, Slope, Drainage network, Surface waterbody, Infrastructure facilities including details of existing features (**a.** Road, **b.** Rail, **c.** Settlement locations), Village boundary with 2011 census based socio-economic profile and action plan (containing soil and water conservation measures).
3. Soft copies of maps compositions on A3 Size paper in **.jpeg format** in CD/DVD.
4. Soft copies of GIS data created in the project in **.shp format** in CD/DVD. (for further used by SECL)
5. Report in **.pdf format** containing interpretation of the thematic data generated with area statistics.

1.7. Snapshots of the SECL Area

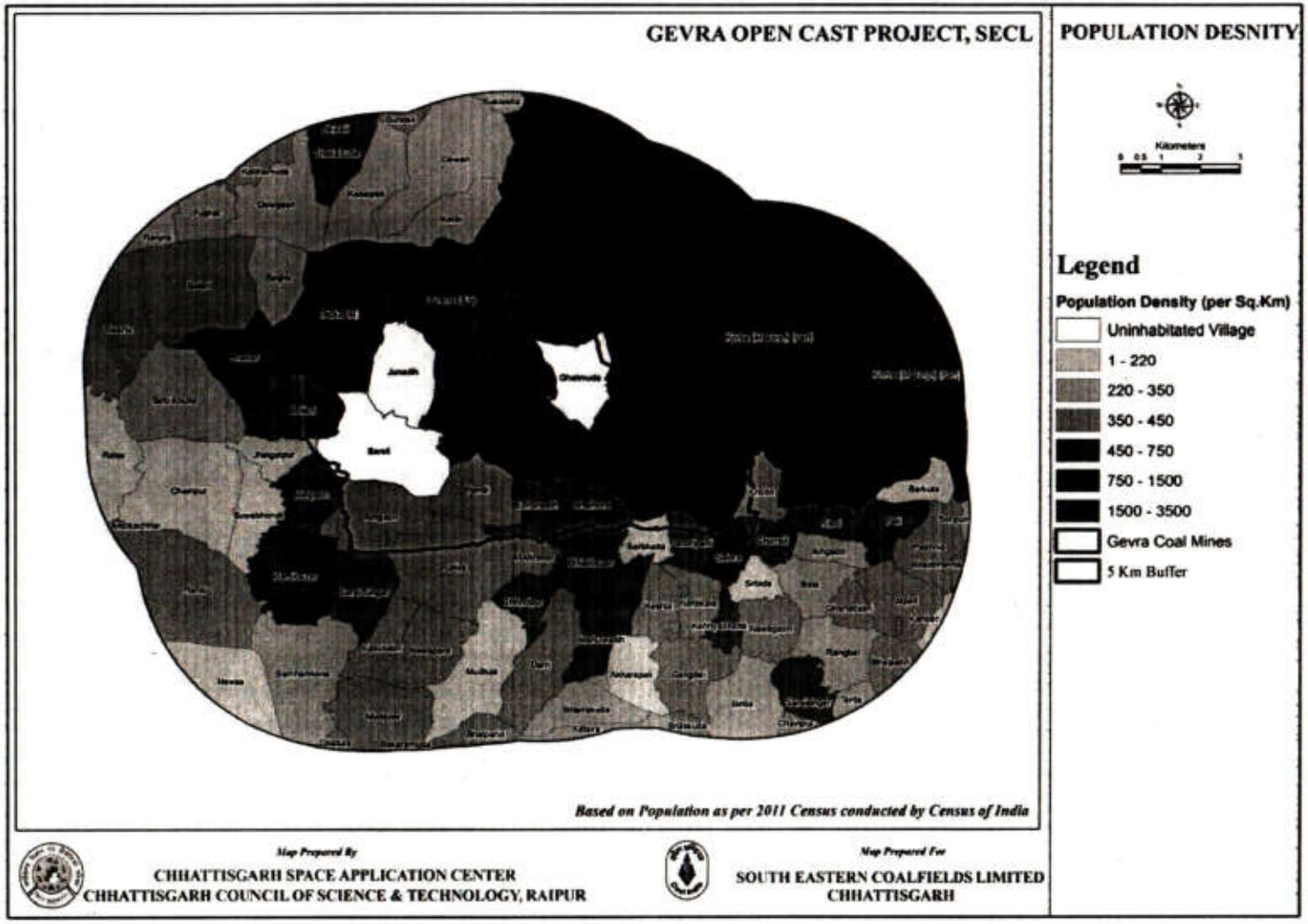

Figure 1-3 Population Density of villages around SECL project area

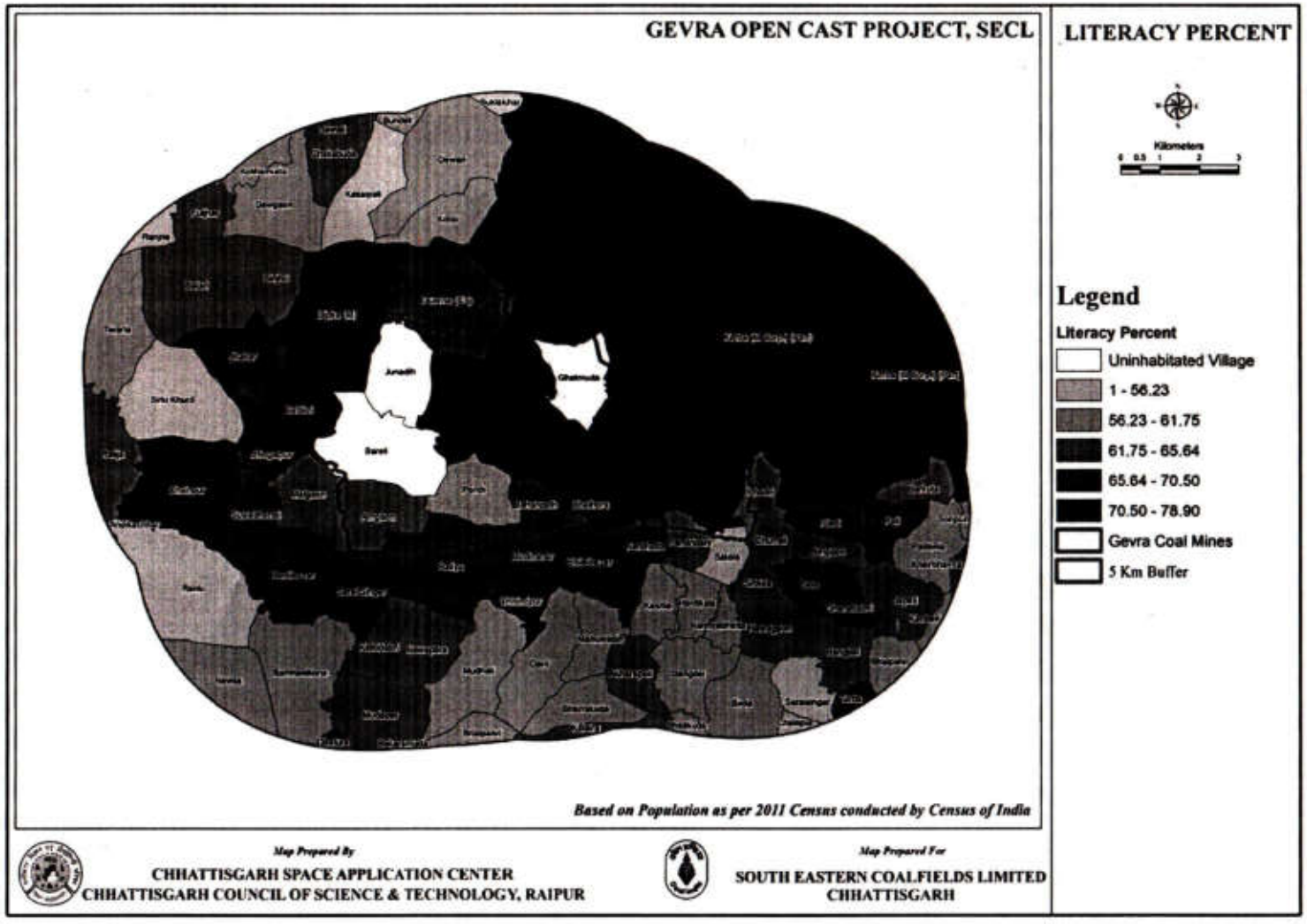

Figure 1-4 Literacy of villages around SECL project area

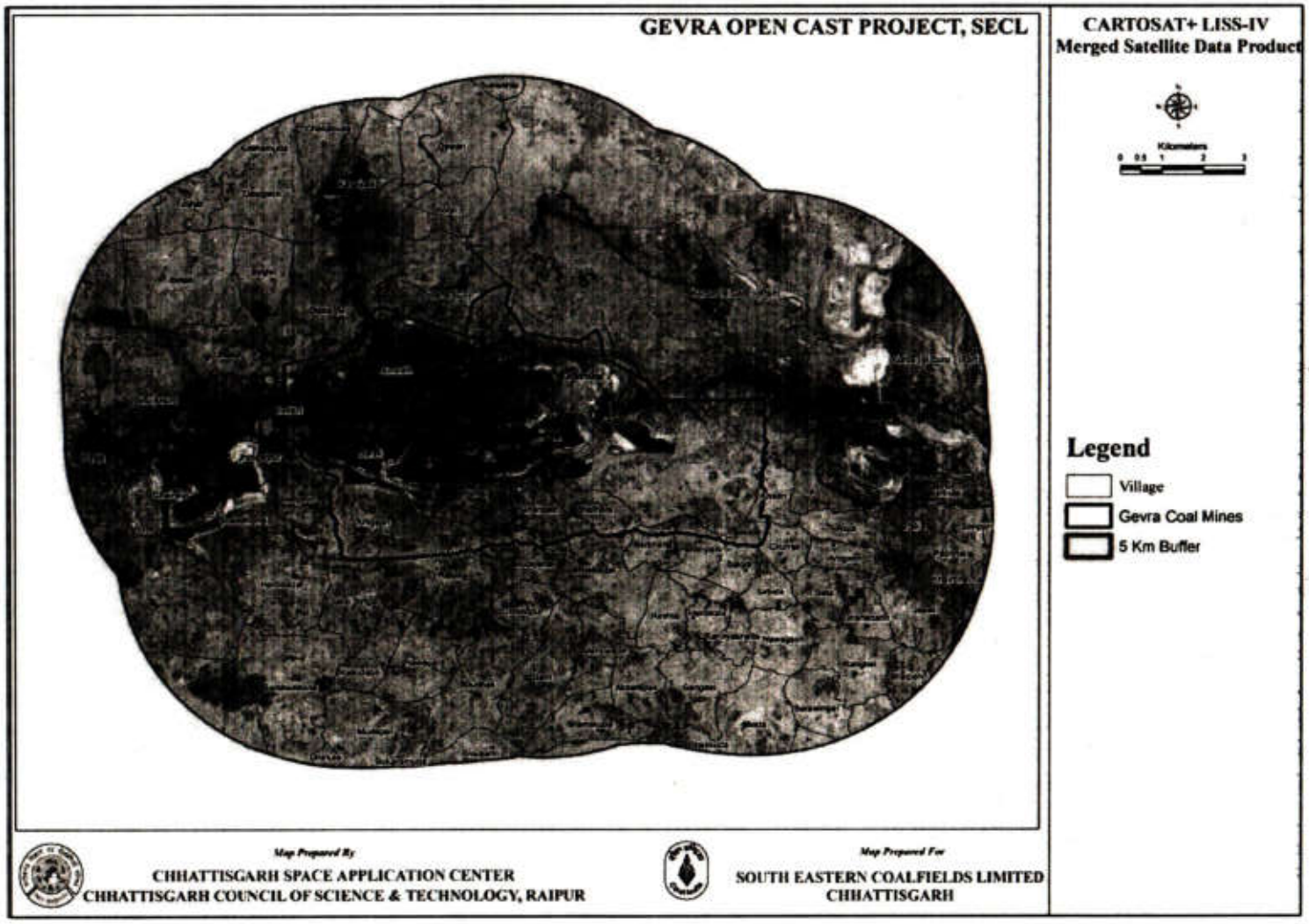

Figure 1-5 Gevra Project Area as viewed on CARTOSAT+ LISS-IV merged Satellite data Product

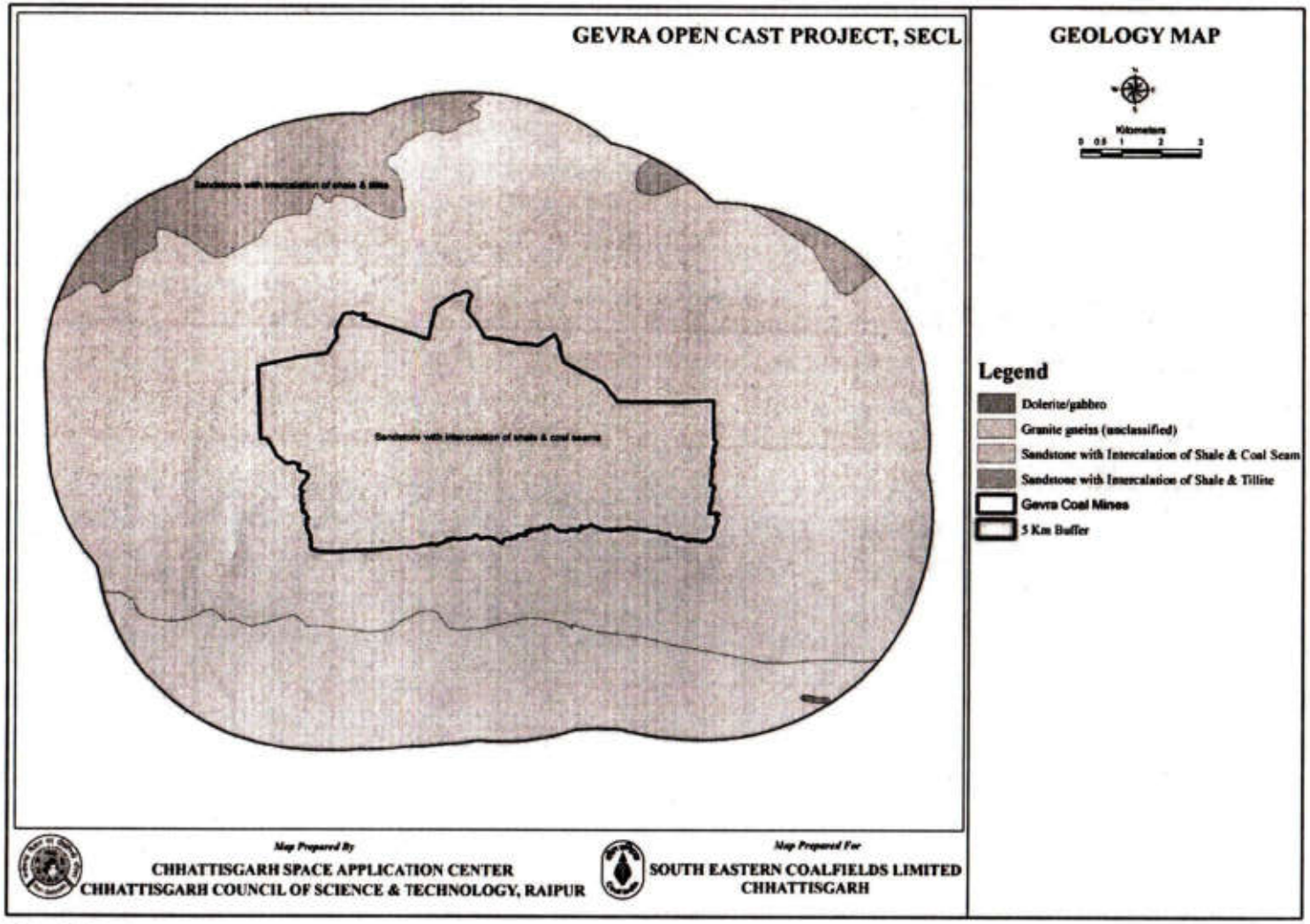

Figure 1-6 Geology of Gevra Project Area

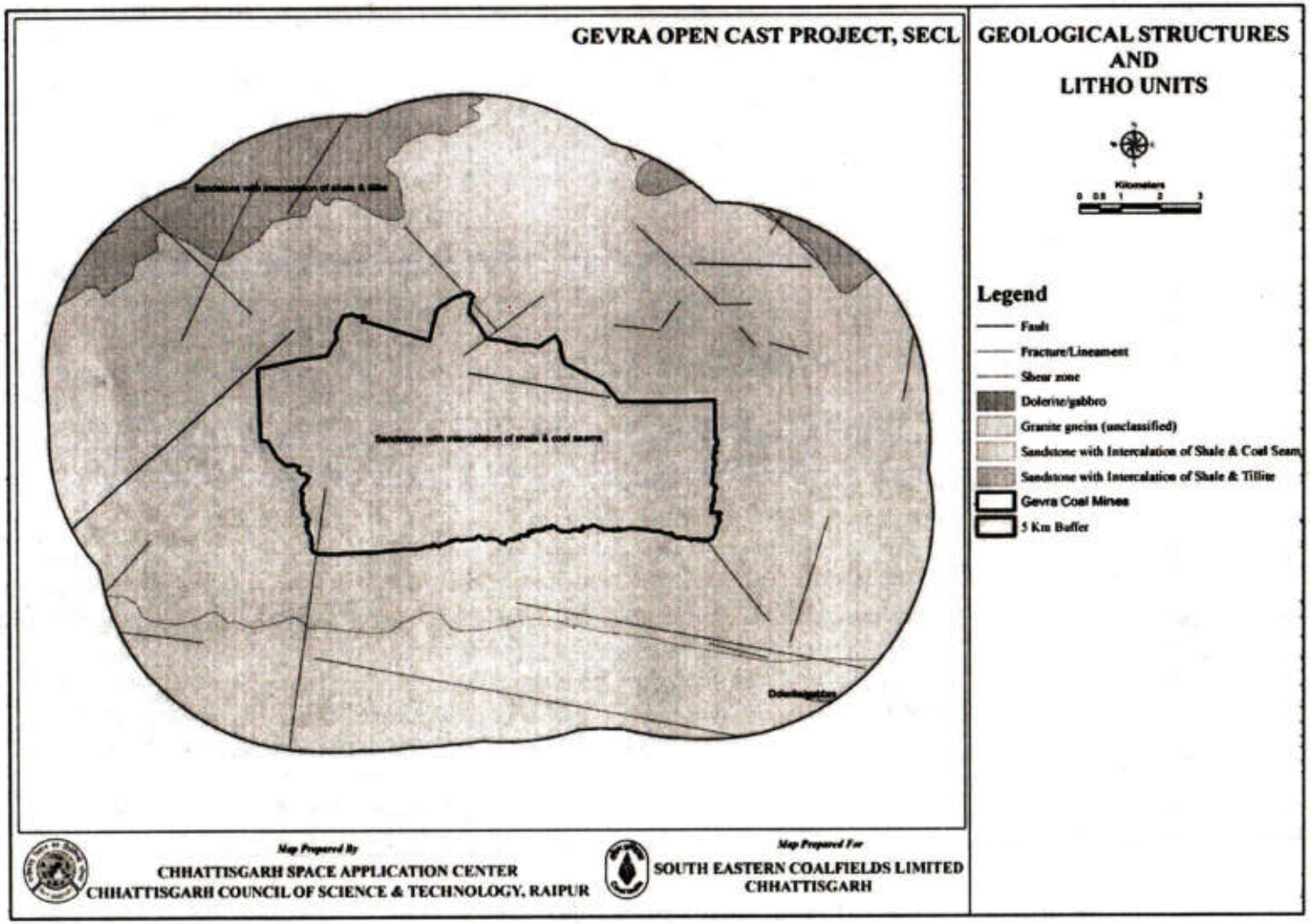

Figure 1-7 Geological Structures of Gevra Project Area

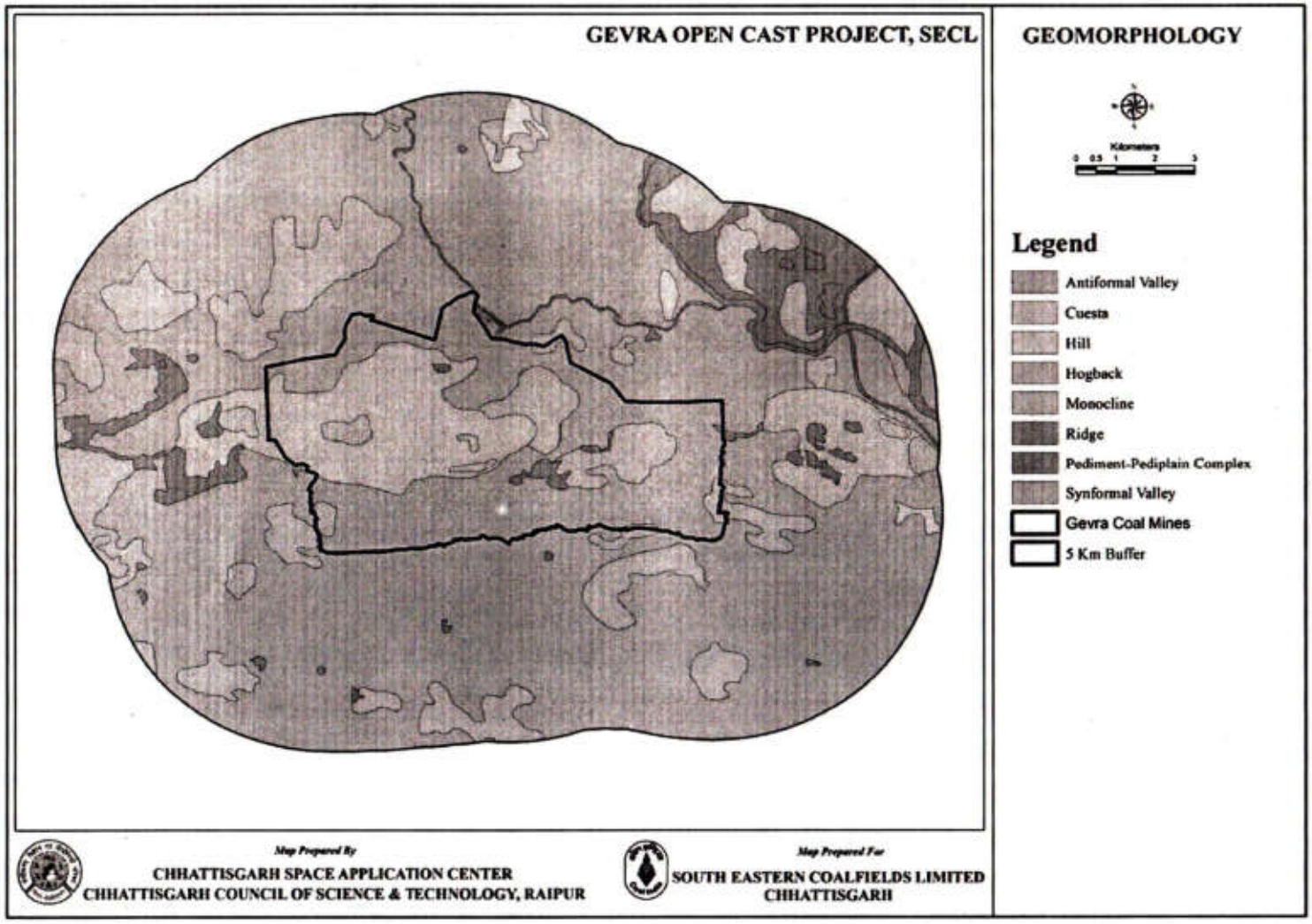

Figure 1-8 Geomorphology of Gevra Project Area (Based on Satellite data interpretation)

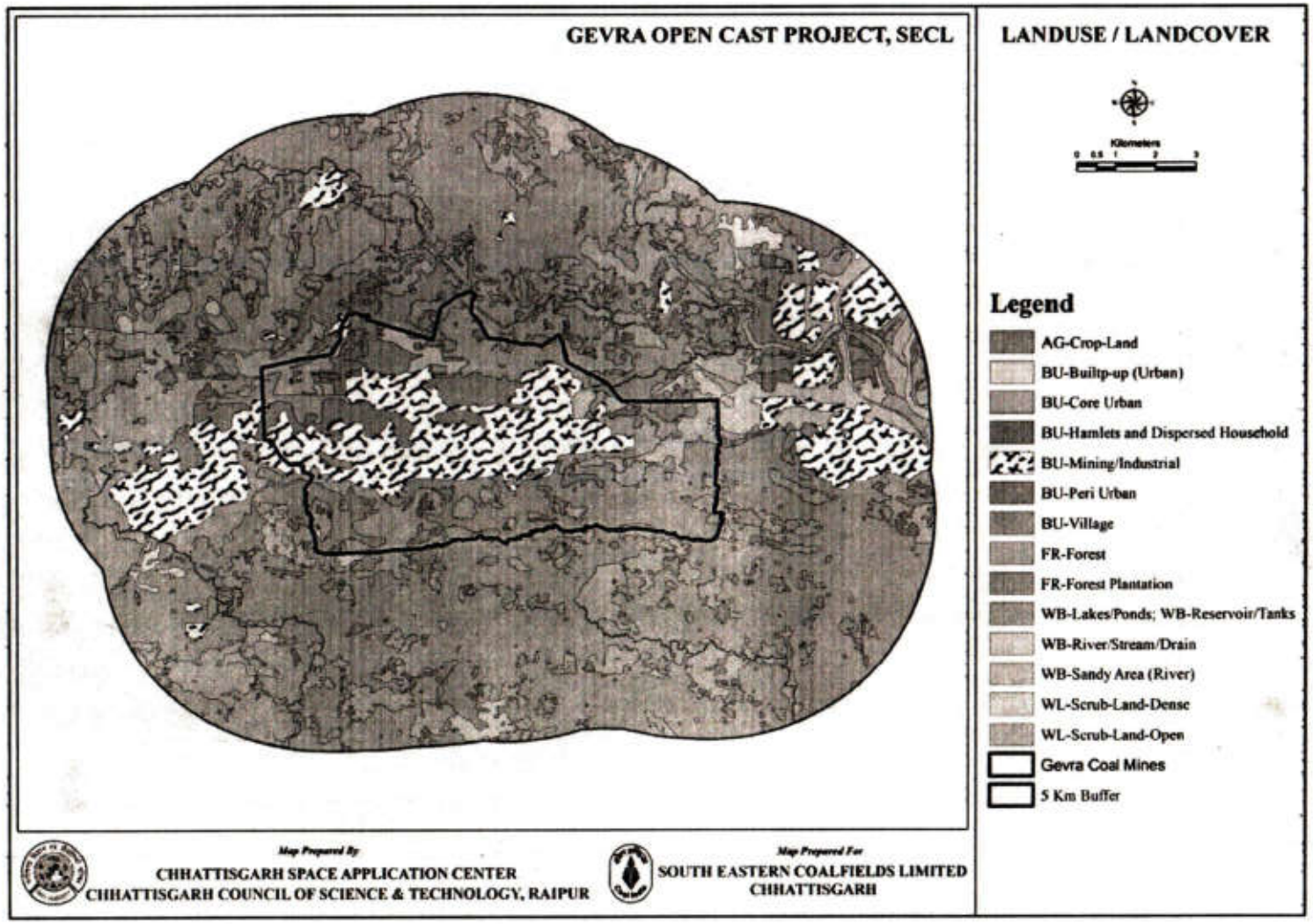

Figure 1-9 Existing Landuse of Gevra Project Area (Based on Satellite data interpretation)

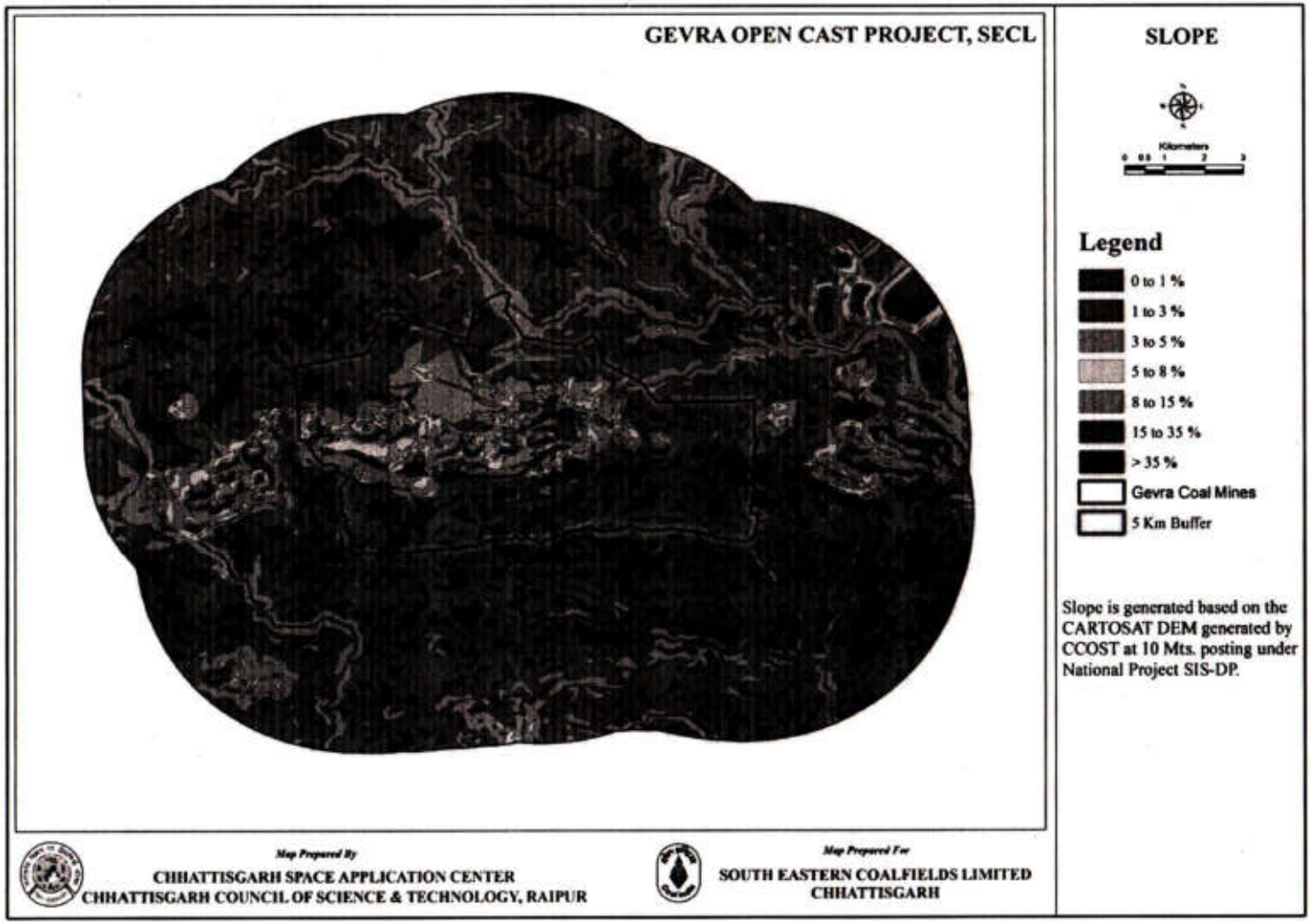

Figure 1-10 Slope of Gevra Project Area

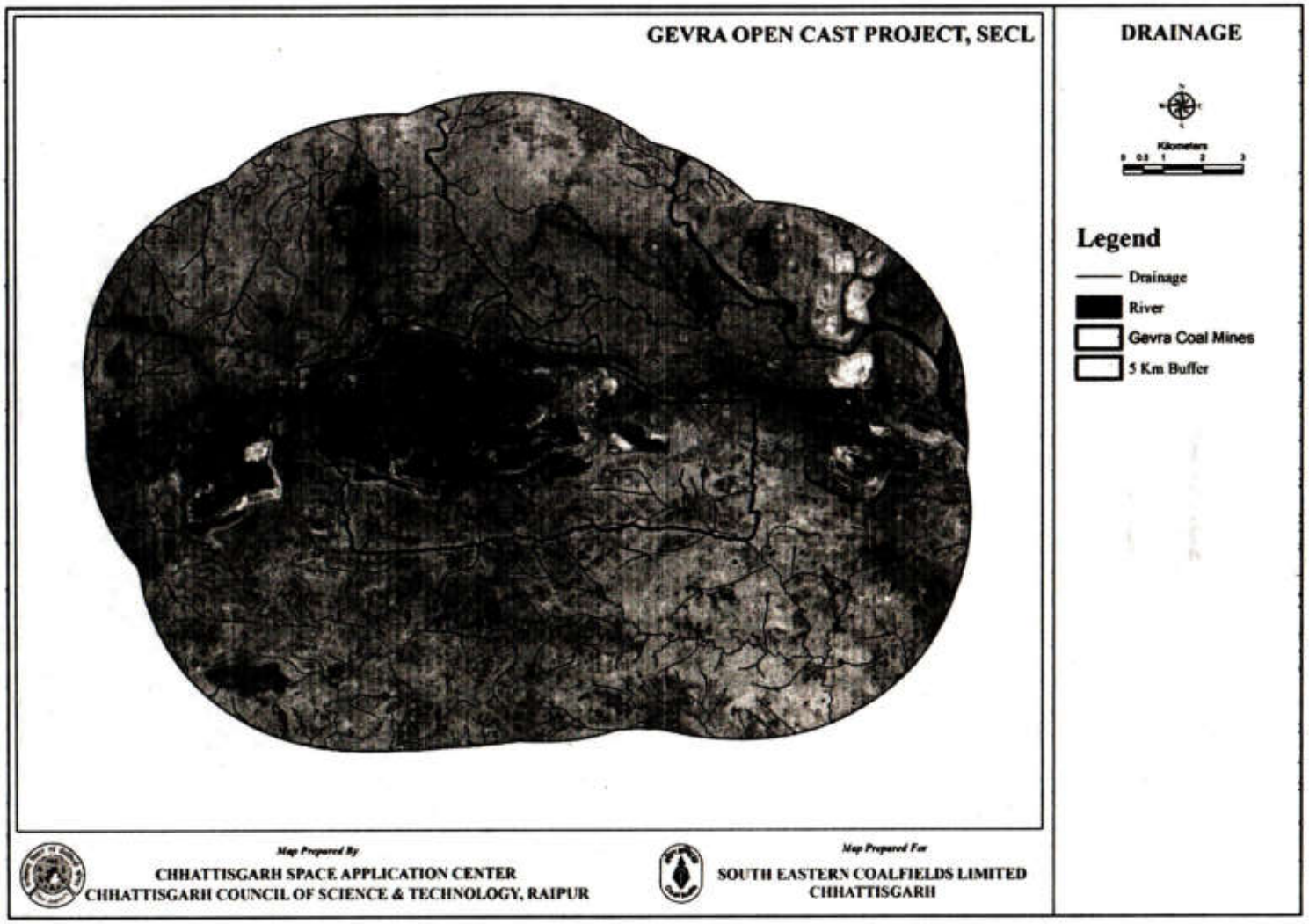

Figure 1-11 Drainage of Gevra Project Area

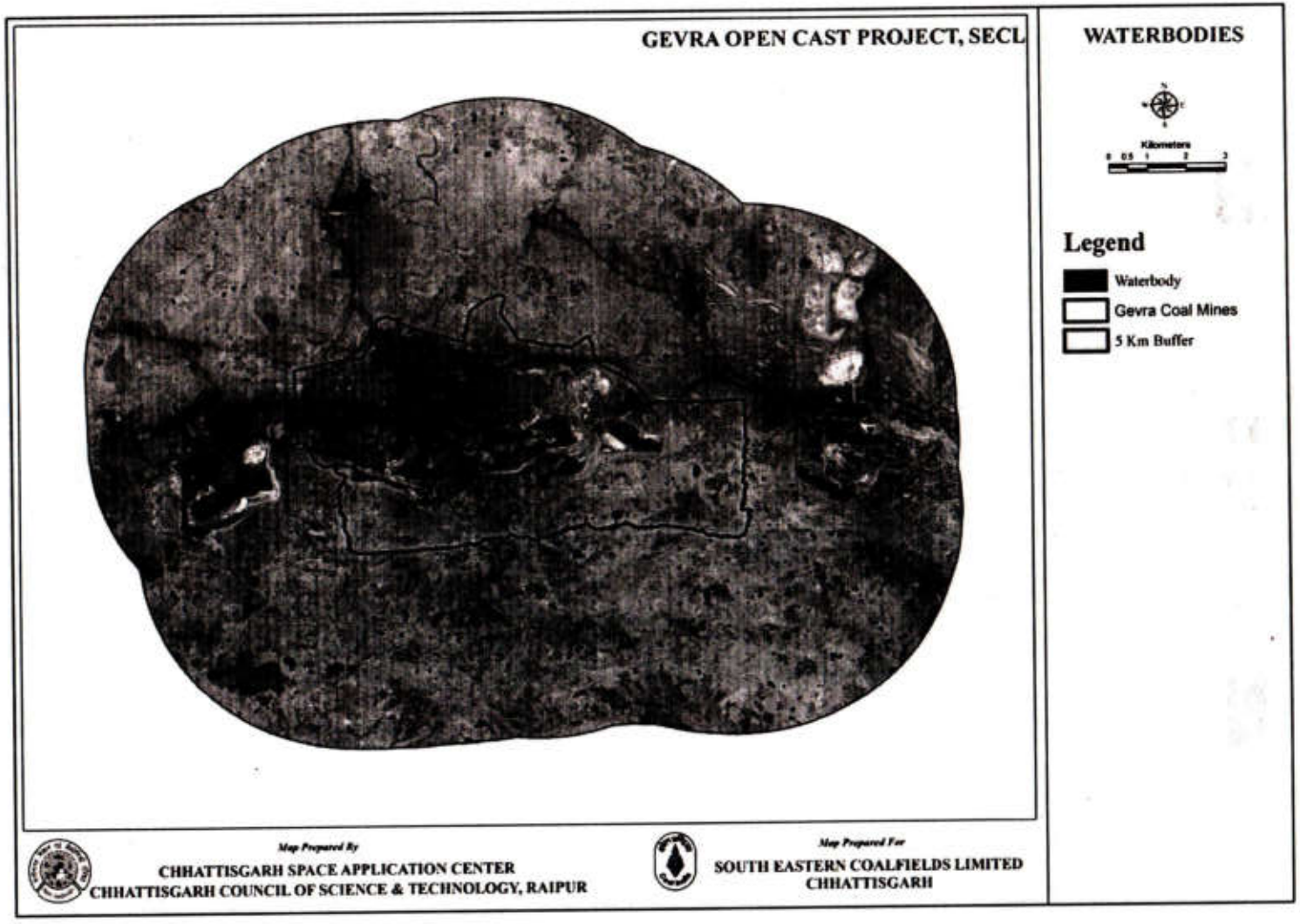

Figure 1-12 Waterbodies of Gevra Project Area

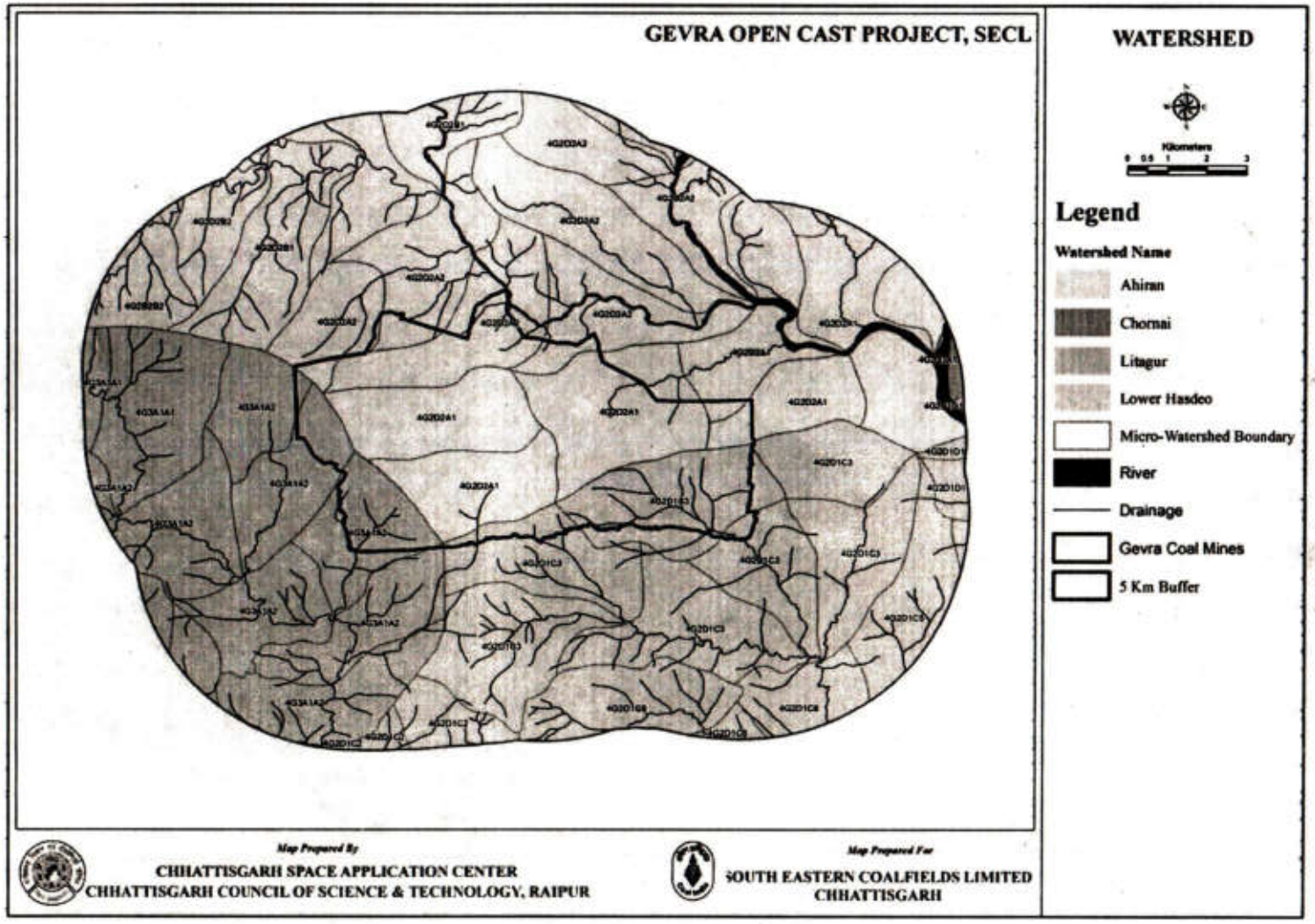

Figure 1-13 Watersheds of Gevra Project Area (Based on NBSSLUP Atlas)

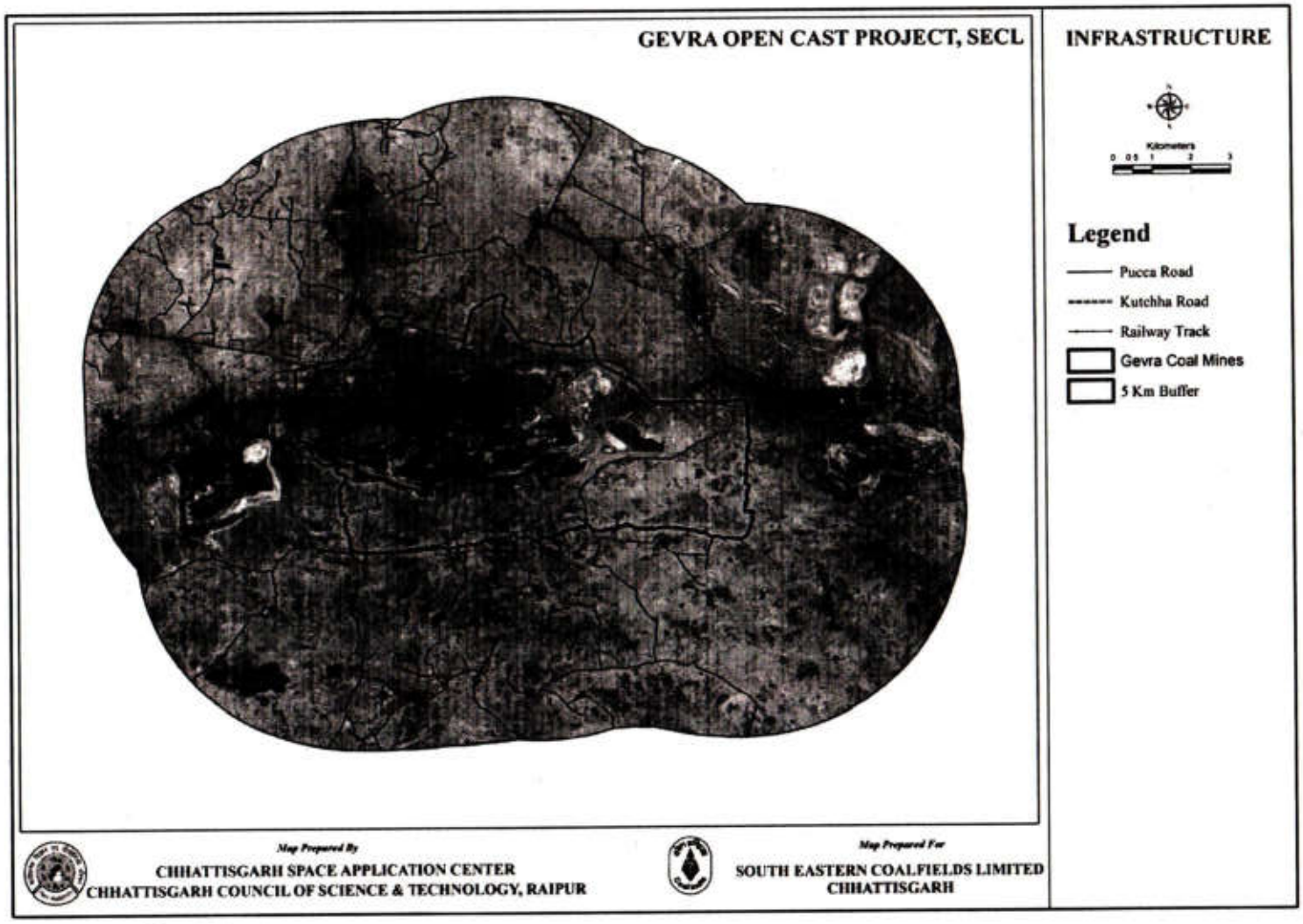

Figure 1-14 Transport Infrastructure of Gevra Project Area

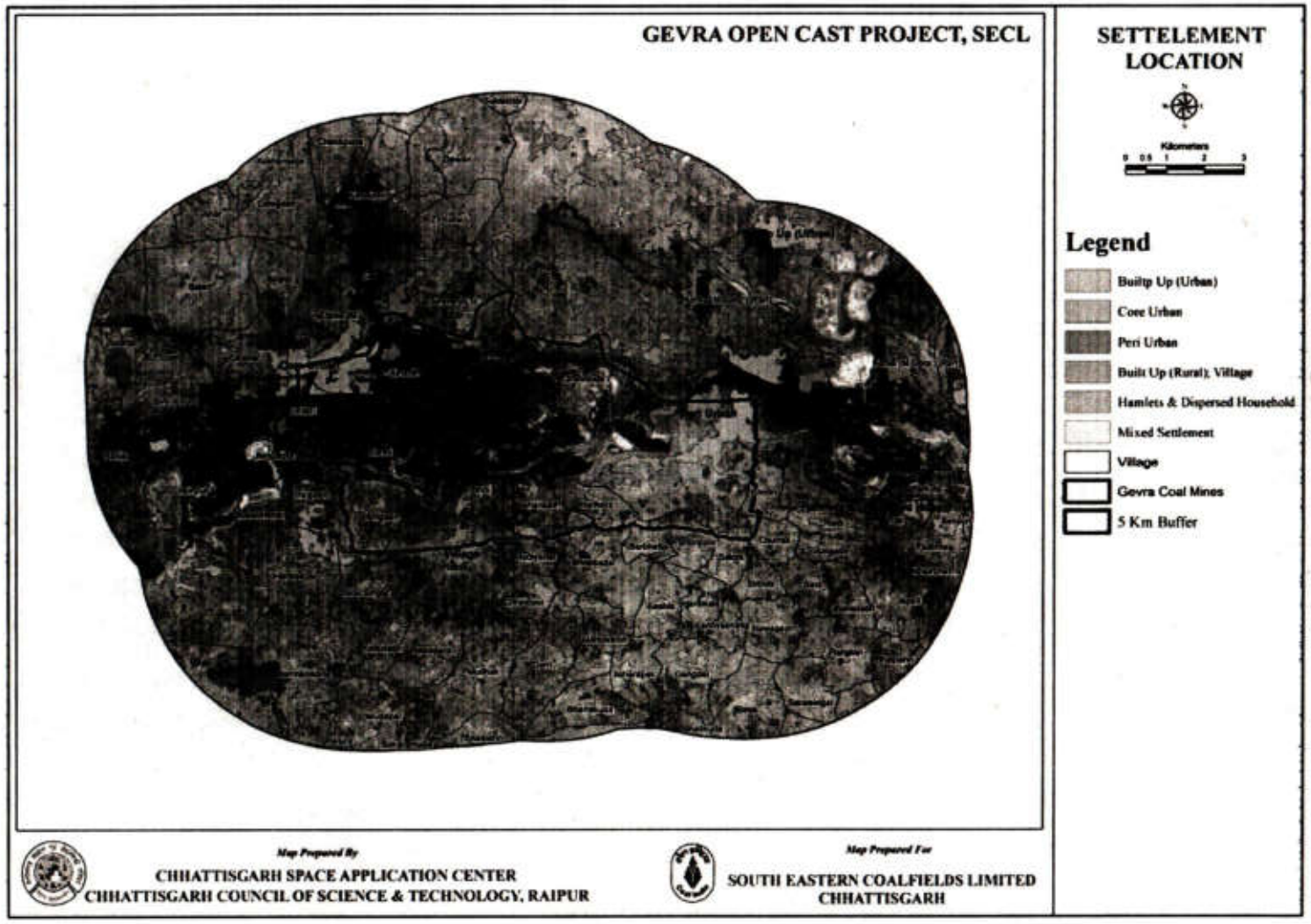

Figure 1-15 Settlement Locations around Gevra Project Area

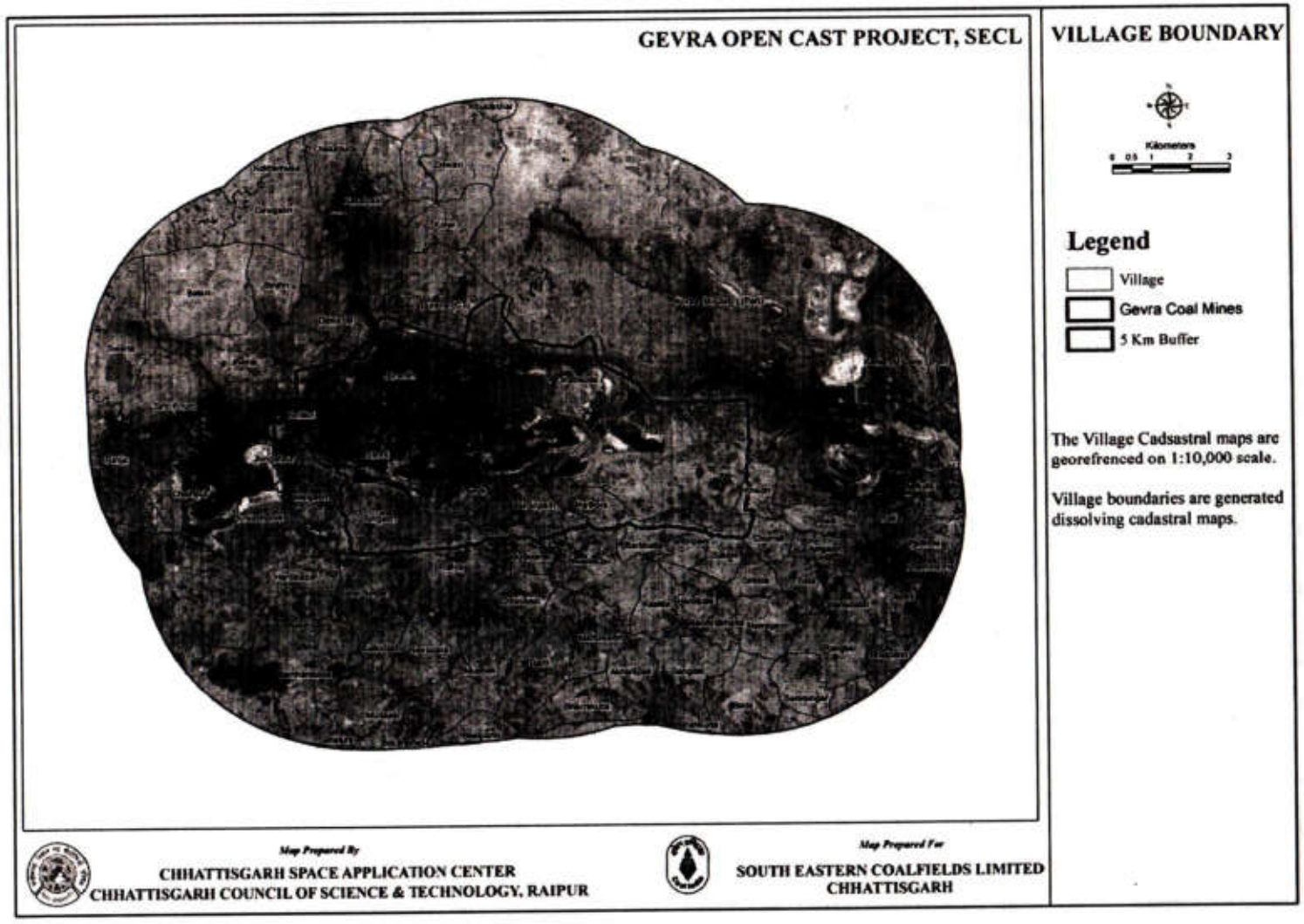

Figure 1-16 Village Boundaries within Gevra Project Area

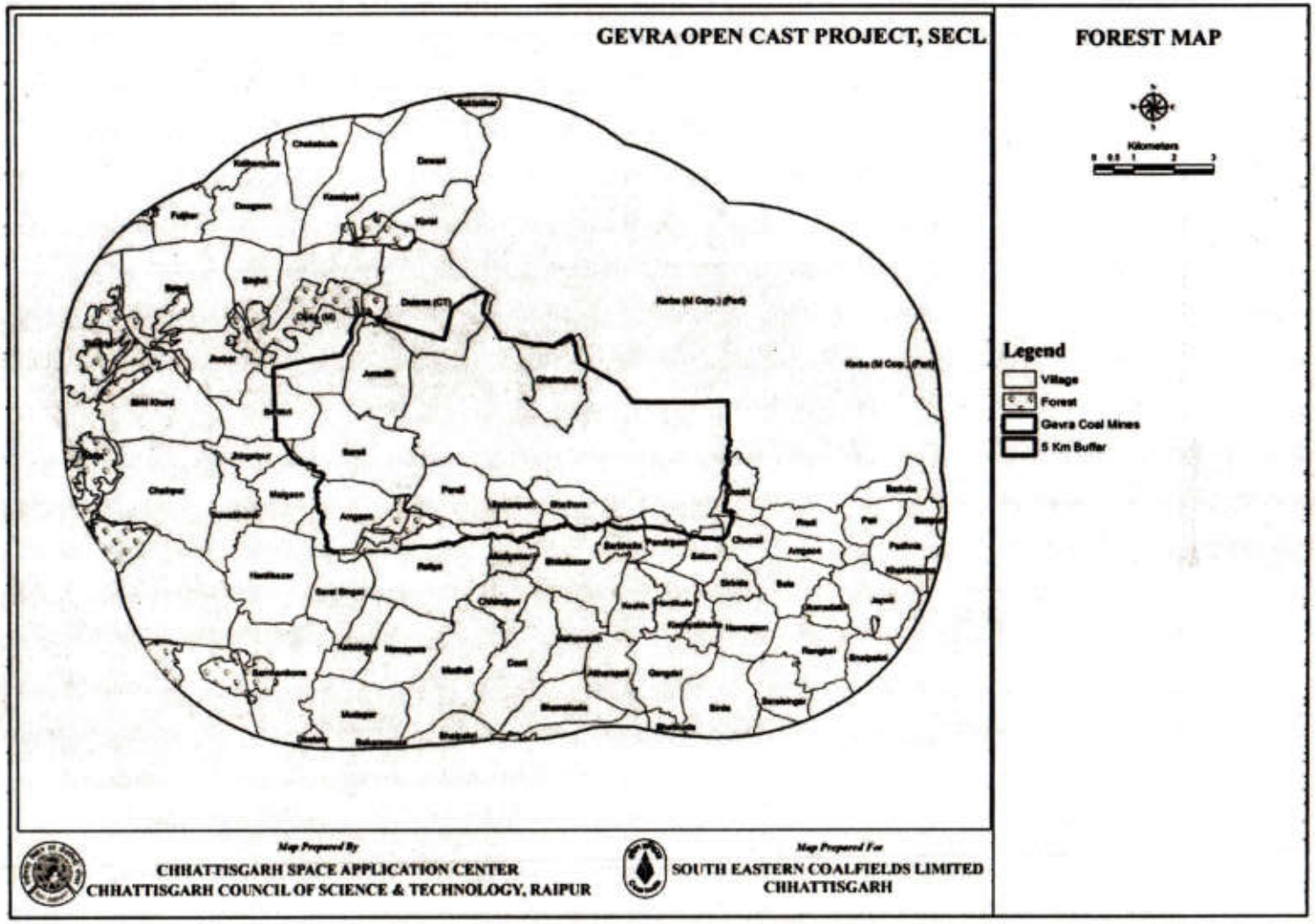

Figure 1-17 Forest Boundaries within Gevra Project Area

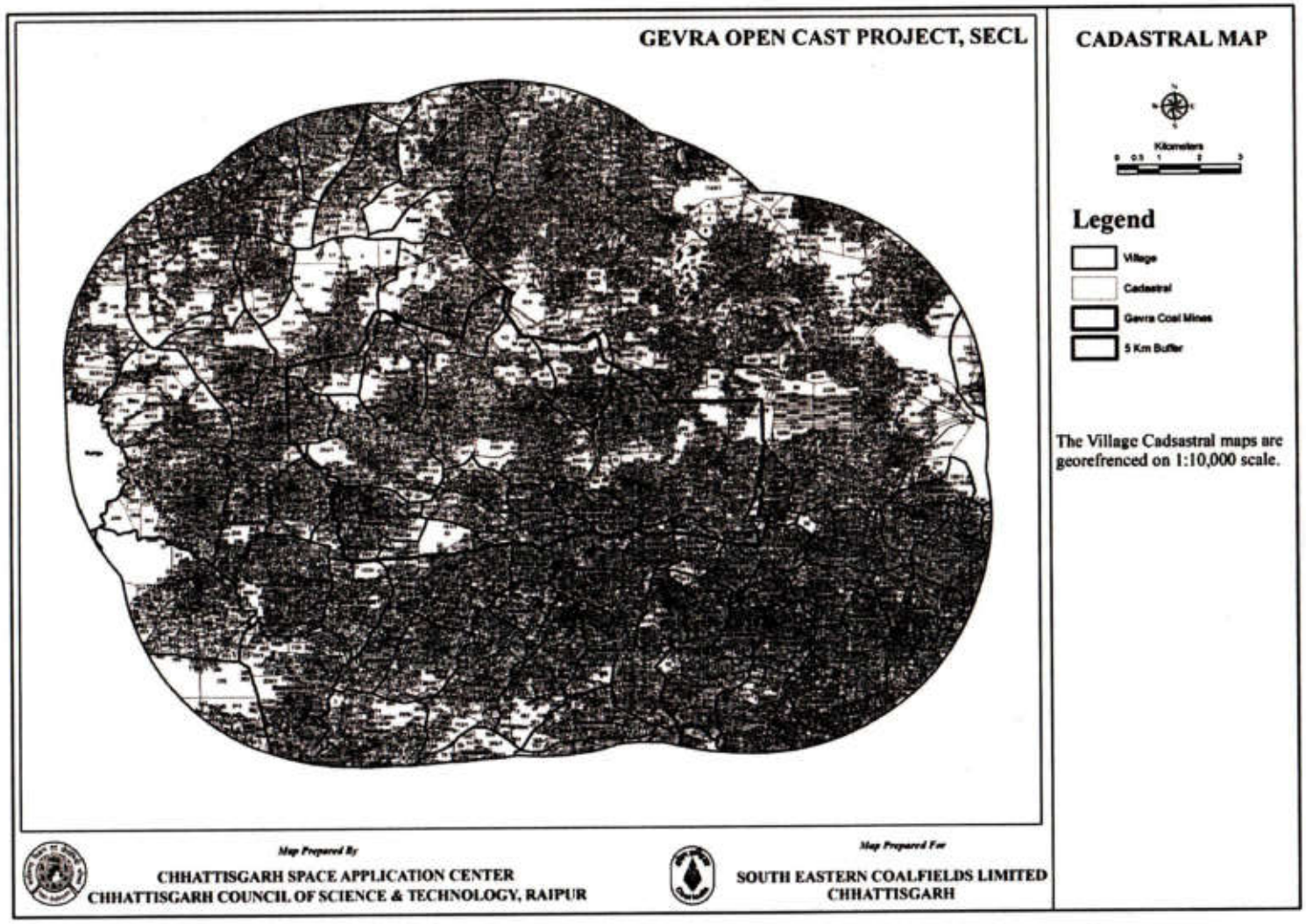

Figure 1-18 Cadastral Details (Transformed on 1:10,000 scale) within Gevra Project Area

2. Erosion Control Recommendations

2.1. Field Observation of Erosion and Sediment Sources

There are numerous potential sources of erosion and sediment transport. The four key areas of concern at the Gevra-SECL Mine include:

- Steep slopes present throughout the Mine site, and various other areas with high potential for water and wind induced erosion;
- Areas where mining has exposed fresh rock and loose material of fresh dump the vegetative cover is removed which exposes erosion prone material. The weathering agents and process can create runoff and fluidized movement of soils and overburden;
- Mine Outlet drains are not mapable from the satellite data used. These Outlet drains also require vegetative bunds where ever erosion is seen on the ground.

The field observations were further seen expressed on the satellite images and have been mapped for deriving erosion control measures in the Gevra-SECL Mine area.

Also the outputs of Universal Soil Loss Equation (ULSE) bring out the areas of erosion. Both the modeled output and the field observation were put together to derive the recommendations for change in existing landuse and built erosion control measures within the existing drainage (small nalas, streams and rivers)

As field observation it is strongly recommended that the Garland Drainage constructed by SECL needs to be strengthened and maintained regularly. The Garland Drainage being not mapable it could not be reflected on the Action Plan Map submitted here.

Table 2-1 Landuse Recommendations

EROSION CONTROL MEASURES (PROPOSED LANDUSE)	AREA (Ha.)
Area Proposed for Phase Wise Plantation	670.49
Gap Plantation	56.11
Intensive Plantation	9.46
Steep Slope Stability Measures/Carpeting	62.42

Table 2-2 Erosion Control Recommendations

Erosion Control Measures (Proposed Structures)	Number of Structures
Check Dam	7
Nala Bunds/Boulder Checks	11
Vegetative Bunds	13

2.2. Weightages assigned

The Weightages assigned to each thematic class used as input to execute Universal Soil Loss Equation are as under:

Table 2-3 Weightages assigned to each thematic class

Name of thematic map - Landuse layer		
Landuse Classes	**C Factor Weightages**	**P Factor Weightages**
AGCR (Crop Land)	0.34	0.4
BUMN (Mining/Industrial)	0.1	0.5
BURH (Hemlets And Dispersed House Hold)	0.2	0.5
BURU (Urban)	0.2	0.5
BURV (Village)	0.2	0.5
BUUC (Core Urban)	0.1	0.5
BUUP (Periurban)	0.2	0.5
BUUR (Builtup (Urban))	0.1	0.5
FRDE (Forest)	0.01	0.2
FRPL (Forest Plantation)	0.01	0.2
WBCN (Canal)	0	0.1
WBLP (Lake/Pond)	0	0.1
WBRS (River/Streem)	0	0.1
WBRT (Reservoir/Tanks)	0	0.1
WBSA (Sandy Area)	0.01	0.2
WLAD (Active Dump)	0.7	1
WLBR (Barren Rock)	0.2	0.6
WLDS (Dump Slope)	0.8	1
WLGU (Guilled/Ravenious)	0.4	1
WLOD (Old Dump)	0.44	1
WLSD (Scrub Land Dense)	0.2	0.4
WLSP (Scrub Land Open)	0.3	0.6
WLWL (WaterLogged)	0.01	0.1

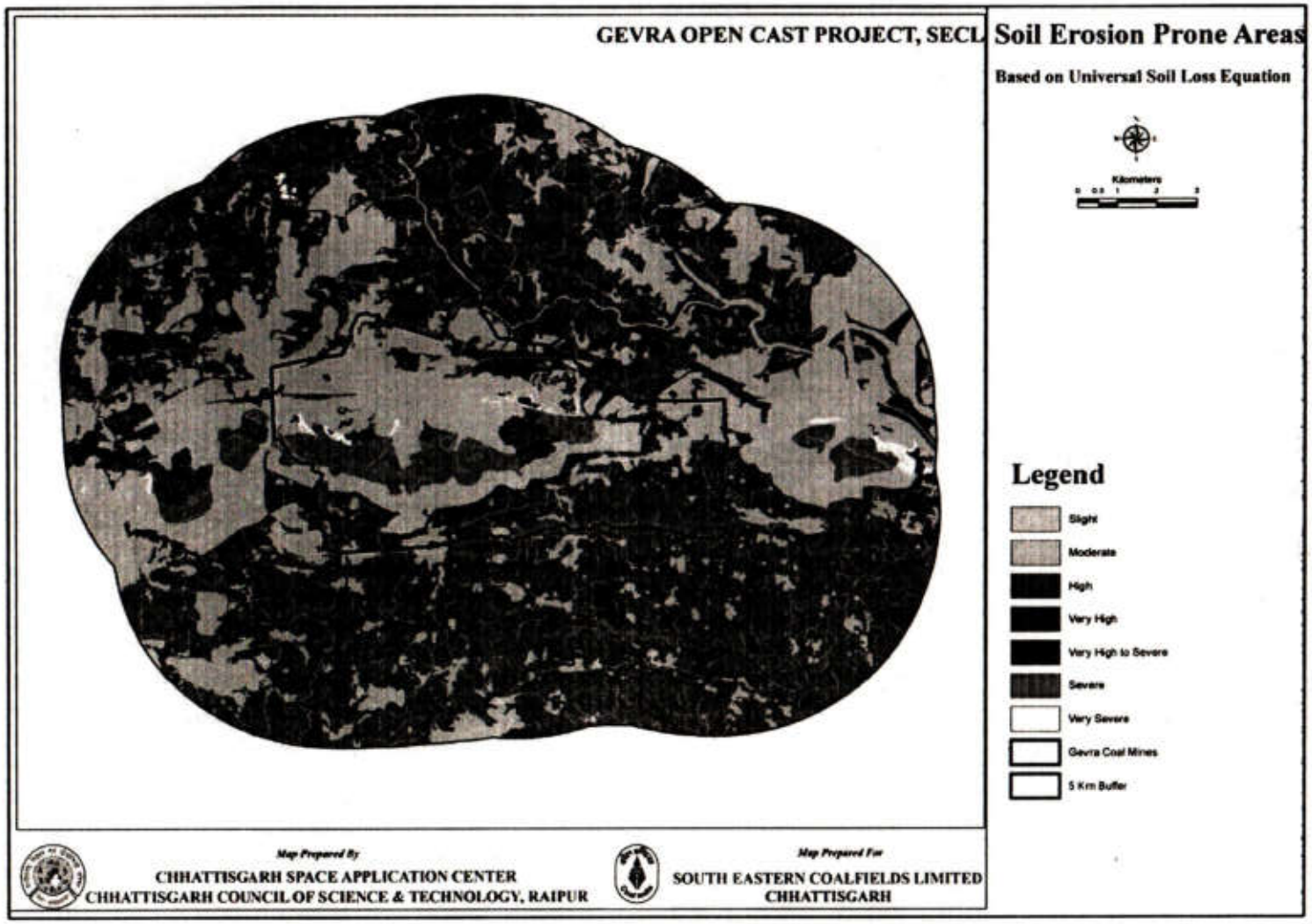

Figure 2-1 Erosion Potential areas within Gevra Project Area

2.3. Sub-Watershed Prioritization

Based on the Soil erosion intensity the sub-watersheds of the study area were assigned priority for erosion control measures. The sub-watersheds Prioritization map is as under:

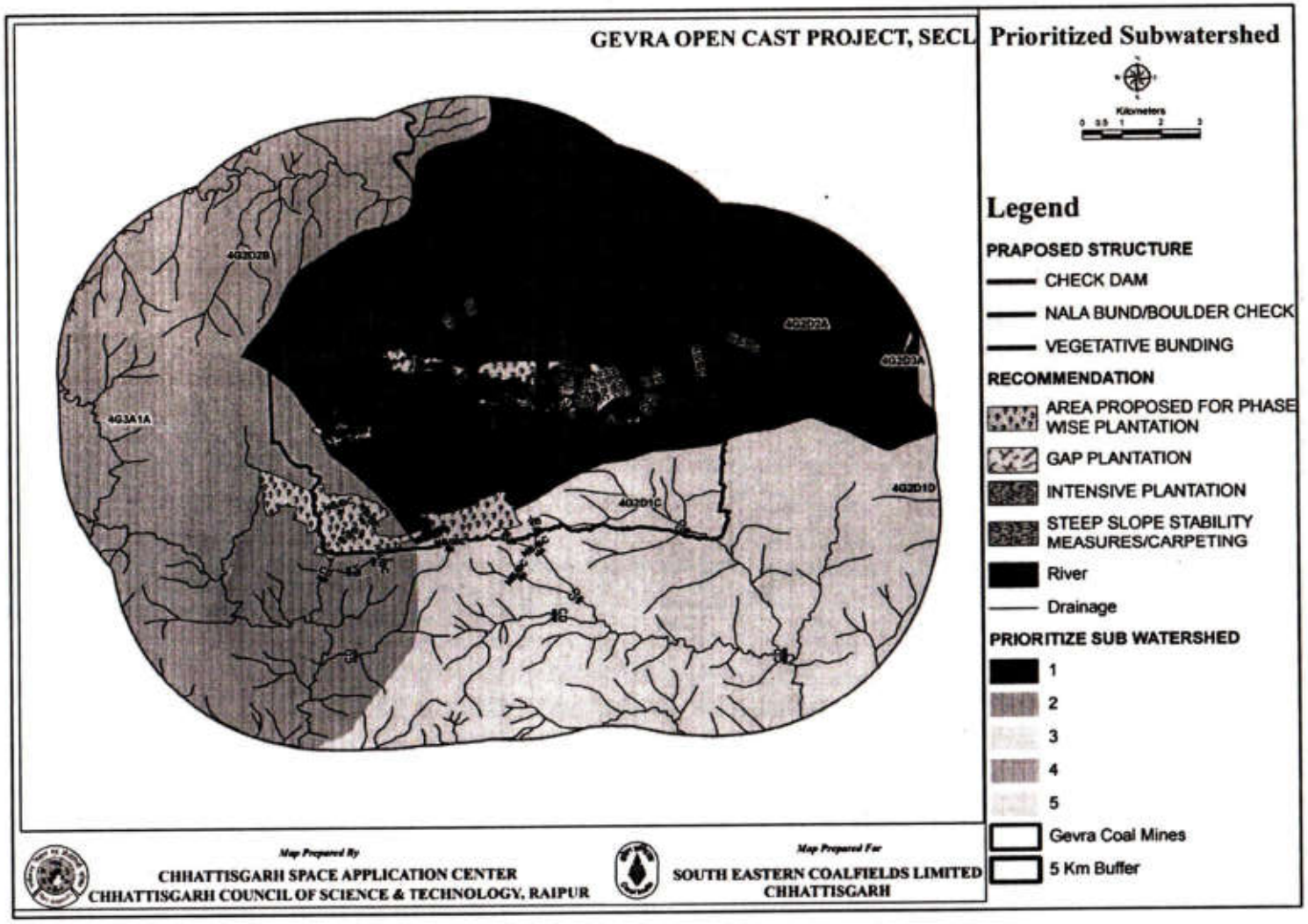

Figure 2-2 Prioritize Sub-watershed within Gevra Project Area

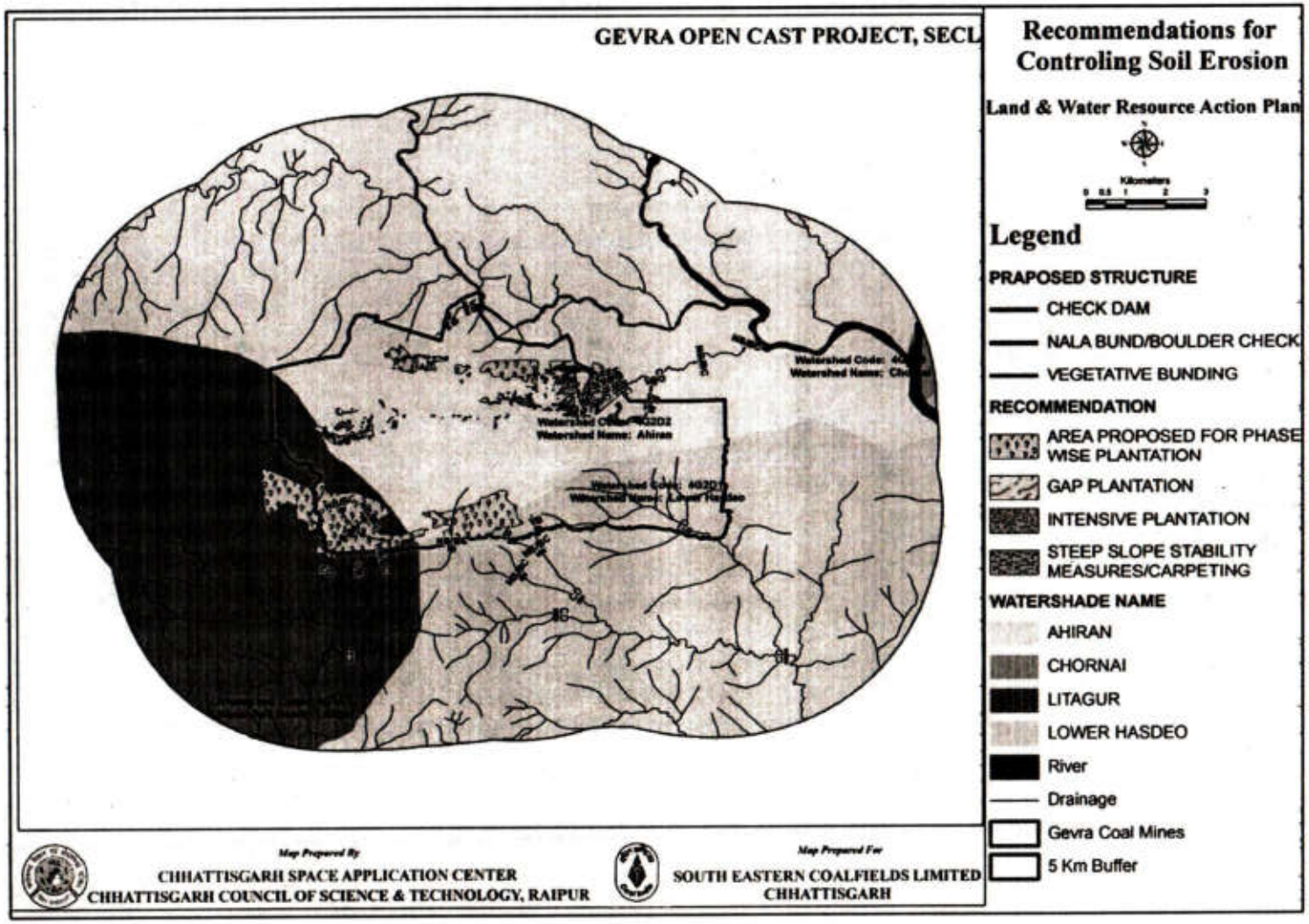

Figure 2-3 Action Plan for Surface Drainage including Surface Conservation Plan within Gevra Project Area

2.3.1. Objectives of Erosion Control Measures

- Intercepting raindrops, reducing their velocity and lessening the erosive effect of rainfall;
- Reducing the velocity of surface runoff, thereby reducing the rate of erosion;
- Sustaining plant roots, and their associated microorganisms, helping to bind soil together, increasing infiltration and reducing runoff; and
- Promoting deeply rooted plants, thus providing tensile strength to slopes and decreasing the incidence of erosion, slumping, and slope failure

2.4. Other Erosion and Sediment Control Measures

Multiple control methods outline in this section provide Gevra Mine options that can be tailored to the type of erosion and sedimentation to be prevented or reduced. On site application of mitigation measures will be determined based on a variety of factors, and the most appropriate should be implemented.

2.4.1. Settling tanks/Ditching

During heavy rainfall and thawing events, water movement on site can be significant. Strategically placed ditches and runoff collection structures can help direct water movement by reducing the total amount of water and reducing its interaction with erosion prone sites. Creating an intercepting ditch above the cut slope will catch water and direct it to less erosion prone areas, thereby reducing runoff over sensitive regions. Intercepting ditches around the mine site convey water to the Main Pit which can be subsequently pumped to water treatment plant.

2.4.2. Revegetation

Establishing a vegetative layer is critical to sites where there are exposed slopes and no further construction is planned. Once established, a vegetative layer eliminates the need for continual monitoring and maintenance by protecting the lighter, organic soil fractions from being displaced, retaining moisture, and preventing slope destabilization. Establishing permanent areas of vegetation, or the temporary seeding of hardy, fast growing species, can offer short or long term erosion control. The choice of vegetation species will depend on many factors, such as availability, hardiness and emergence.

Two important factors in choosing vegetation well suited specifically for erosion control are; those that provide roughness on the site surface, and have extensive rooting systems that will break up the top layer of soil. Both of these factors will improve water infiltration into the soil. Seedbed preparations for vegetation establishment on steep slopes will have to be considered for those sites where it is determined to be a concern, and could include slope stabilization, stream course protection through the use of mats and mulch or organic matter application. Soil properties including organic matter content and nutrient level must also be addressed to promote successful re-vegetation. Revegetation must be done with appropriate

engineering consultation to ensure that the roots of seeded species will not adversely affect the structural properties of the surface to be revegetated. Following construction of mine infrastructure, revegetation can be immediately implemented on areas disturbed during construction, but which are no longer required for operations (e.g., overburden stockpiles, disturbed pits, along road routes and road ditches).

2.4.3. Silt Fencing

Installing silt fence as a sediment control method is a common method employed for level areas with diffuse erosion potential from sheeting on light soils. Silt fences are used to protect downslope areas and prevent further movement of the sediment as it is being transported. Settling of coarser material occurs as the runoff ponds upstream of the fence. Silt fencing is not appropriate for heavy flow areas and requires continuous maintenance.

2.4.4. Sheeting/Matting

Impermeable polyethylene sheets can offer immediate and temporary erosion control. Their use is suited for emergency responses or for short term protection in an area where the sheets will not be disturbed, because they are susceptible to tearing or movement by wind and heavy rainfall events. Also, they require inspection and maintenance until more permanent erosion measures can be implemented. However, properly installed and anchored, they can provide complete isolation of the erodible surfaces from the effects of wind and water erosion.

Blanco et al, (2008) mentioned the importance of coir matting in dump stability. The coir matting is widely used in the dump slope stabilization and prevention of dump failures. It is a biodegradable coir geo-textile made of coconut fiber or husk. It facilitates new vegetation by absorbing water and preventing topsoil from drying out. Seeding or plantation is done after blanketing the coir matting on the dump slope. They provide dump soil good support allowing natural vegetation to become established. The process of coir matt blanketing on the dump slopes is strongly recommended. First the dump soil slopes are maintained properly. The seeding is done next. After that the coir matt are placed on the dump with proper anchor. Then the seedling will soon cover the dump with vegetation which stabilizes the dump.

Paithankar A. G. et al, (2001) described the plantation system in the dump slope. Vegetation in dump slope protects dump failures through root systems and plant cover, which improve soil particle aggregation in a low cohesion situation, preventing the dump failures. The roots of the fast growing plants and bushes penetrate through the failure zones to the stable and the compact soil beneath. So it holds the moving dump soil mass and prevents the dump failures.

2.4.5. Proposed Species for Plantation

It is very important to evolve vegetation at multiple levels - plant trees, shrubs, and groundcovers. A multi-level canopy will do the best job of intercepting and slowing precipitation before it hits the ground, thus reducing surface erosion.

Also species selection should be such that species found in the state should be preferred and Leguminous should be planted in conjunction with other species. The recommended planting material for the SECL area are as under:

Table 2-4 Recommended Species of Plants

Proposed Tree Species (Local/Common Name)	Botanical Name
Mahua (Seed)	*Madhuca longifolia*
Saja (Seed)	*Terminalia tomentosa*
Aam (seed, seedling transplantation)	*Mangifera indica*
Kumhi (Seed)	*Careya arborea*
Rohan (Seed)	*Soymida febrifuga*
Sidha (Seed)	*Lagerstroemia parviflora*
Neem (Seed)	*Azadirachta indica*
Karanj (seed)	*Pongamia pinnata*
Haldu (Seed)	*Adina cordifolia*
Bel (Seed)	*Aegle marmelos*
Maharukh (Seed)	*Ailanthus excelsa*
Chichwa (Seed)	*Albizzia odoratissima*
Asta (Seed)	*Bauhinia racemosa*
Kasai (Seed)	*Bridelia retusa*
Mainphal (Seed)	*Catunaregam spinosa*
Lasora (Seed)	*Cordia myxa*
Jamrashi (Seed)	*Elaeodendron glaucum*
Bhonrsal (Seed)	*Hymenodictyon excelsum*
Baranga (Seed)	*Kydia calycina*
Kari (Seed)	*Miliusa tomentosa*
Kusum (Seed)	*Schleichera oleosa*
Jamun (Seed	*Syzgium cumini*
Rohina (Seed)	*Soymida febrifuga*
Reetha	*Sapindus mukorossi*
Korkat	*Dillenia pentagyna*
Moyan	*Lannea coromandelica*
Bargad (Transplantation)	*Ficus benghalensis*
Pipal (Transplantation)	*Ficus religiosa*

Umar (Transplantation)	*Ficus racemosa*
Pakar (Transplantation)	*Ficus infectoria*
Imli (Seed) Leguminous	*Tamarindus indica*
Amaltas (Seed) Leguminous	*Cassia fistula*
Babool (Seed) Leguminous	*Acacia nilotica*
Kala siris (Seed) Leguminous	*Albizzia lebbeck*
Palas (Seed) Leguminous	*Butea monosperma*
Proposed Shrub Species (Local/Common Name)	**Botanical Name**
Chilhi (Seed)	*Casearia tomentosa*
Dikamali (Seed)	*Gardenia gummifera*
Adusa (Seed)	*Adhatoda vasica*
Akol (Seed)	*Alangium salvifolium*
Karonda (Seed)	*Carissa spinarum*
Baibirang (Seed)	*Embelia ribes*
Marodphali (Seed)	*Helecteres isora*
Dudhi (Seed, Transplantation)	*Holarrhena antidysentirica*
Chipti (Seed) Leguminous	*Desmodium pulchellum*
Chapar (Seed) Leguminous	*Moghamia chapar*
Proposed Climbers and Lianas Species (Local/Common Name)	**Botanical Name**
Satawar (Seed, Tuber)	*Asparagus racemosus–*
Dangkanda (Seed, Tuber, Bulbil)	*Dioscorea bulbifera*
Baichandi (Tuber, Bulbil)	*Dioscorea hispida*
Gudmar (Cutting, Seed)	*Gymnema sylvestre*
Palasbel (Seed)	*Spatholobus roxburghii*
Malkangni (Seed)	*Celestrus peniculata*
Dhimarbel (Seed)	*Ichnocarpus frutescens*
Ramdaton (Seed)	*Smilax zeylanica*
Guruch (Cutting, Seed)	*Tinospora cordifolia*
Keoti (Seed)	*Vallaris heynei*
Keoti (Seed)	*Ventilago calyculata*
Mahul (Seed) Leguminous	*Bauhinia vahlii*
Bel Palas (Leguminous)	Butea roxburghii

Soil Stabilizer Grasses	**Botanical Name**
Vetiver grass	*Chrysopogon zizanioides*
Moonj grass	*Saccharum munja*
Stylish Hemata grass	*Stylosanthes Sp.*
Andropogon aciculatus	
Dicanthium (Bothriochloa) pertusa	
Saccharum spontaneum	
For water logged areas	**Botanical Name**
Bermuda grass also known as Vilfa stellate	*Cynodon dactylon*

2.4.5.1. Mechanism

Planting a relatively large area, especially on steep slopes of old dumps where fresh erosion is seen, hydroseeding can be carried out in a very short period of time. It can be very effective for hillsides and sloping lawns to help with erosion control and quick planting. Hydro seeding will typically cost effective than planting with sod, but more than broadcast seeding. Results are often quick with high germination rates producing grass growth in about a week and mowing maintenance beginning around 3 to 4 weeks from the date of application. Fiber mulch accelerates the growing process by maintaining moisture around the seeds thereby increasing the rate of germination.

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