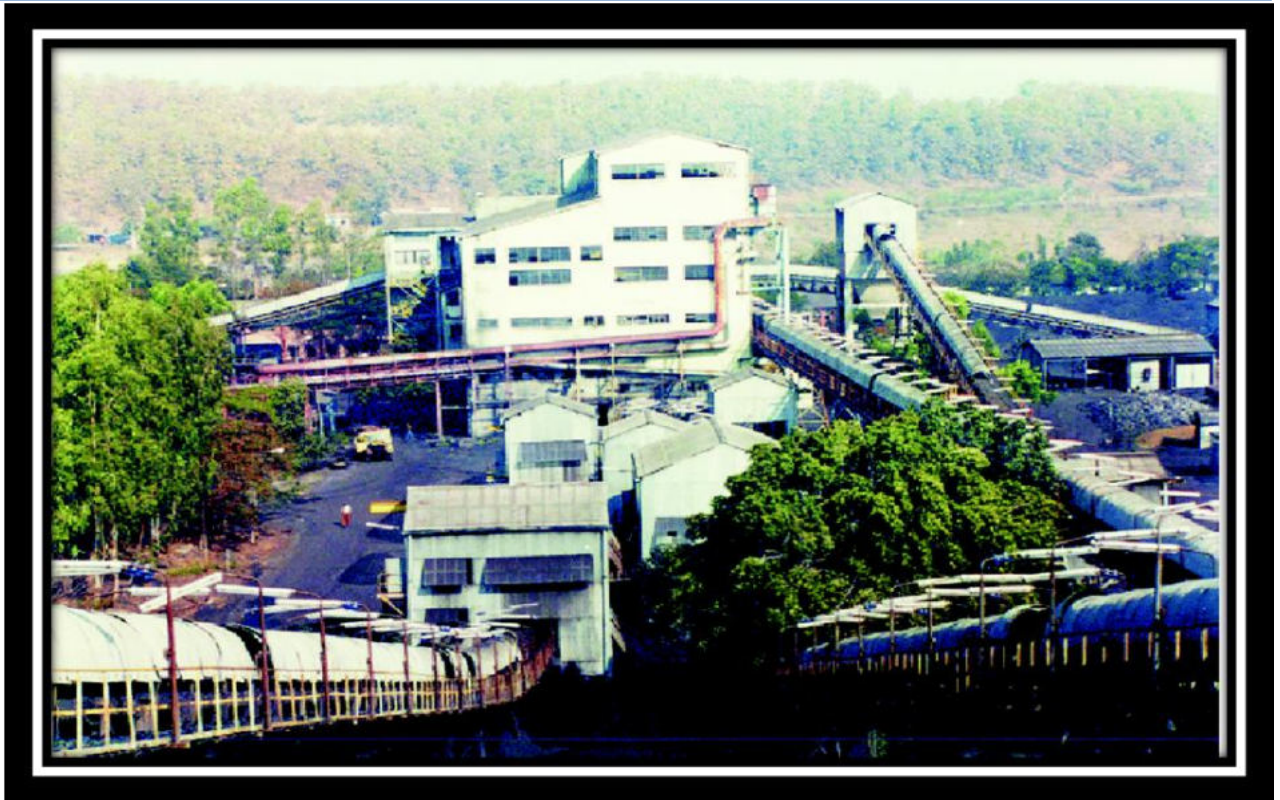




2011

Impact of Coal Mine Waste Water Discharge on Surroundings With Reference to Heavy Metals



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1.1 INTRODUCTION

Mineral plays an important role in the economic development of the country as mineral is the basic raw materials to promote the growth. The development and extent of judicious utilization of minerals resources adds to the index of growth of a nation and its people. The mineral industry in India is reckoned not only as an important contributor to the country's GDP and foreign trade, it is also one of the major industries that absorb a considerable amount of the country's working population. This industry is spread almost all over the Indian territory and has operations in some of the remotest areas of the country, where it can claim itself to be the sole leader of infrastructure development.

The mining leases occupying about 0.7 million hectares which is 0.21 percent of the total land mass of the country. This industry operates more than 2729 mines which consist of 570 coal mines, 2300 metalliferrous mines and a source of small mines. India produces 86 minerals out of which 04 are fuel minerals, 10 metallic, and 46 non-metallic and 23 minor minerals. The Indian economy to a great extent depends on the value of the minerals produced, as these represent a major portion of the materials for the nation's industrial activities. India has immense natural resources and is ranked among top 10 globally for deposits in iron ore at 206 million tons, coal 491 million tons and bauxite 23084 thousand tons, which constitute 10 %, 7.7 % and 10.8% respectively of the world's resources.

India has a long history of commercial coal mining covering nearly 220 years starting from 1774 by M/s Sumner and heatly of East India Company in the Raniganj Coalfield along the Western bank of river Damodar. However, for about a century the growth of Indian coal mining remained sluggish for want of demand but the introduction of steam locomotives in 1853 gave a fillip to it. Within a short span, production rose to an annual average of 1 million tons (MT) and India could produce 6.12 MT per year by 1900 and 18 MT per year by 1920. The production got a sudden boost from the First World War but went through a slump in the early thirties. The production reached a level of 29 MT by 1942 and 30 MT by 1946.

With the advent of Independence, the country embarked upon the 5-year development plans. At the beginning of the 1st Plan, annual production went up to 33 MT and during the 1st Plan period itself, the need for increasing coal production efficiently by systematic and scientific development of the coal industry was being felt. Setting up of the National Coal Development Corporation (NCDC), a Government of India Undertaking in 1956 with the collieries owned by the railways as its nucleus was the first major step towards planned development of Indian Coal Industry. Along with the Singareni Collieries Company Ltd. (SCCL) which was already in operation since 1945 and which became a Government company under the control of Government of Andhra Pradesh in 1956, India thus had two Government coal companies in the fifties. SCCL is now a joint undertaking of Government of Andhra Pradesh and Government of India sharing its equity in 51:49 ratios.

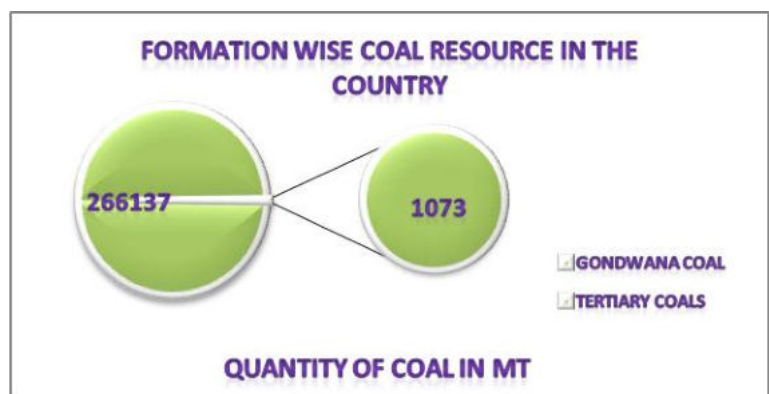
Right from its genesis, the commercial coal mining in modern times in India has been dictated by the needs of the domestic consumption. On account of the growing needs of the steel industry, a thrust had to be given on systematic exploitation of coking coal reserves in Jharia Coalfield. Adequate capital investment to meet the burgeoning energy needs of the country was not forthcoming from the private coal mine owners. Unscientific mining practices adopted by some of them and poor working conditions of labor in some of the private coal mines became matters of concern for the Government. On account of these reasons, the Central Government took a decision to nationalize the private coal mines. The nationalization was done in two phases, the first with the coking coal mines in 1971-72 and then with the non-coking coal mines in 1973. In October, 1971, the Coking Coal Mines (Emergency Provisions) Act, 1971 provided for taking over in public interest of the management of coking coal mines and coke oven plants pending nationalization. This was followed by the Coking Coal Mines (Nationalization) Act, 1972 under which the coking coal mines and the coke oven plants other than those with the Tata Iron & Steel Company Limited and Indian Iron & Steel Company Limited, were nationalized on 1.5.1972 and brought under the Bharat Coking Coal Limited (BCCL), a new Central Government Undertaking. Another enactment, namely the Coal Mines (Taking over of Management) Act, 1973, extended the right of the Government of India to take over the management of the coking and non-coking coal mines in seven States including the coking coal mines taken over in 1971. This was followed by the nationalization of all these mines on 1.5.1973 with the enactment of the Coal Mines

(Nationalization) Act, 1973 which now is the piece of Central legislation determining the eligibility of coal mining in India.

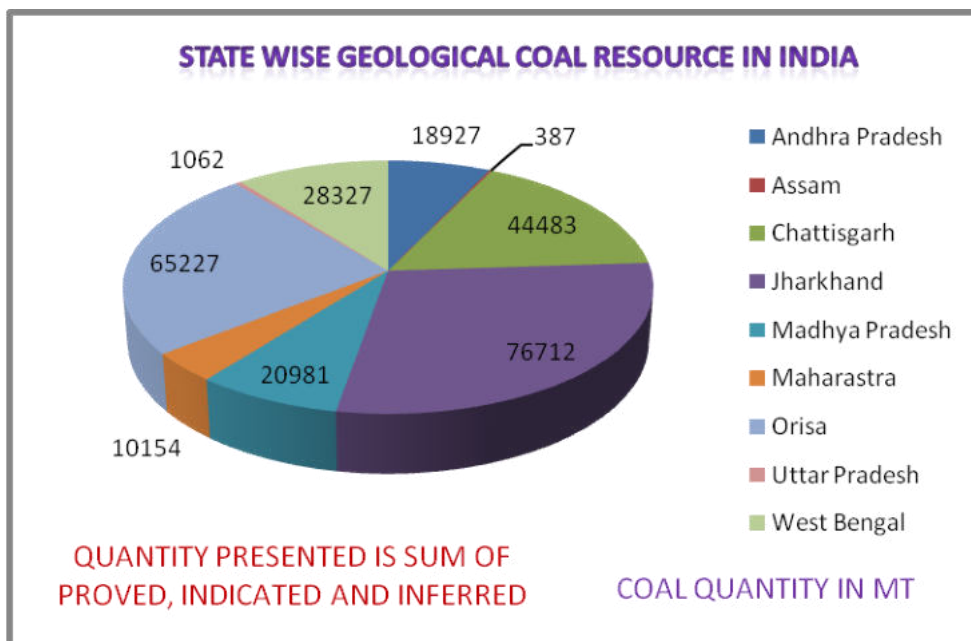
1.2 COAL RESERVE IN THE COUNTRY

India with 2.7 per cent of the world reserves ranks sixth in the world in coal resources occurring in Gondwana and tertiary formations. The coal resources of India are available in sedimentary rocks of older Gondwana Formations of peninsular India and younger Tertiary formations of north-eastern/ northern hilly region. Based on the results of Regional/ Promotional Exploration, where the boreholes are normally placed 1-2 Km apart, the resources are classified into Indicated or Inferred category. Subsequent Detailed Exploration in selected blocks, where boreholes are less than 400 meters apart, upgrades the resources into more reliable

‘Proved’ category. The Formation-wise and Category-wise coal resources (in MT) of India as on 1.4.2009 are presented. As a result of



exploration carried out up to the depth of 1200m by the GSI, CMPDI and MECL etc, a cumulative total of 267.21 Billion tonnes of Geological Resources of Coal have so far been estimated in the country as on 1.4.2009. The state-wise distribution of coal resources (in MT) and its categorisation are as follows:



1.3 COAL STATUS IN STUDY AREA

Coal India Limited under Ministry of coal, Government of India has total eight direct subsidiaries working in the country for coal mining in different states. In the states under jurisdiction of Zonal office Bhopal three coal companies namely Western Coal Limited (WCL), Northern Coal Limited (NCL) and Southern Eastern Coal Limited (SECL) are involved in coal mining. In addition to this there are few mines being operated by state government and public entrepreneurs. State wise coal mine status in central zone is as below-



Sl. No	Name of Company	OC	UG	Mixed	Total
Madhya Pradesh					
01	Western Coal Ltd.	07	23	03	33
02	Northern Coal Ltd.	--	09	--	09
03	South Eastern Coal Ltd	08	29	--	37
04	Private Entrepreneurs	03	--	--	03
05	State Government	--	02	--	02
Chhattisgarh					
06	South Eastern Coal Ltd	14	39	01	54
07	Private Entrepreneurs	06	--	--	06

2.1 MINING CONCEPT AND TECHNOLOGIES

Modern mining process involve prospecting for ore bodied, analysis of the profit potential of a proposed mine, extraction of the desired materials and finally reclamation of the land to prepare it for further use once the mine is closed. The first is discovery of ore body, which is carried out through prospecting or exploration to find and then define the extent, location and value of the ore body. This leads to mathematical resources estimation to estimate the size and grade of the deposit. The estimation is used to conduct a pre- feasibility study to determine the theoretical economics of the ore deposit. This identifies, early on, whether further investment in estimation and engineering study is warranted and identifies key risks and area for further work. The next step is to conduct a feasibility study to evaluate the financial viability, technical and financial risk and robustness of the project. This is when company makes the decision to develop the mine or to walk away from the project. This include mine planning to evaluate the economically recoverable portion of the deposit. Once the analysis determines a given ore body is worth recovering, development begins to create access to the ore body. The mine building and processing plants are built up and any necessary equipment is obtained.

The most economical method of coal extraction from coal seam depends on the depth and quality of the seams, geology and environmental factors. Coal mining processes are differentiated by

weather they operate on the surface or underground. Surface mining and underground mining are the two basic methods of mining. The choice of mining method depends primarily on depth of burial, density of over burden and thickness of coal seam. Seams relatively close to surface at depths less than 50m are usually surface mined. Coal that occurs at depths of 50-100m is usually deep mined but in some cases surface mining techniques can be used.

2.1.1 Open cast or surface mining-

When coal seams are near the surface, it may be economical to extract the coal using open cut mining methods. Open cast coal mining recovers a greater proportion of the coal deposit than underground methods more of the coal seam strata may be exploited. Large open cast mines can cover an area of many square kilometers and use very large equipment.



In this mining method, explosives are used in order to break the strata through surface or overburden, of the mining area. The overburden is then removed by draglines or by shovel and truck. Once the coal seam is exposed it is drilled, fractured and thoroughly mined in strips. This is most common practice used in the country and approximately 70% of coal is being extracted by this process. The source of waste water generation in this process is from seepage of ground water from bottom or sides of the mining area.

2.1.2 Area mining-

This is also a type of strip mining in which coal seam is exposed by removing the overburden in long cuts. The soil from the first strip is deposited in an area outside the planned mining area. Spoils from subsequent cuts are deposited as fill in the previous cut after coal has been removed. Usually, the process is to drill the strip of overburden next to the previous mined strip. The drill holes are filled with explosives and blasted. The overburden is then removed using large earthmoving equipment. The overburden is put into the previously mined strip. When all the overburden is removed, the underlying coal seam will be exposed. This block of coal seam may be drilled and blasted or otherwise loaded for transport. This process is most suitable for areas with flat terrain.

2.1.3 Contour mining –

The contour mining method consists of removing overburden from the seam in a pattern following the contours along a ridge or around hillside. This method is most commonly used in areas with rolling to steep terrain. It was once common to deposit the spoil on the down slope side of the bench thus created, but this method of spoil disposal consumes much additional land and created severe landslide and erosion problems. The haul back or lateral movement methods generally consist of an initial cut with the soil deposited down slope or at some other site and spoil from the second cut refilling the first. A ridge of undisturbed natural material 5-6m wide is often intentionally left at the outer edge of the mined area. This barrier adds stability to the reclaimed slope by preventing spoil from slumping or sliding downhill. The limitations on contour strip mining are both economic and technical.

2.1.4 Mountaintop removal mining-

Mountain coal mining is a surface mining practice involving removal of mountaintops to expose coal seams, and disposing of associated mining overburden in adjacent “valley fills”. Valley fills occur in steep terrain where there are limited disposal alternatives. Mountain removal combines area and contour strip mining methods. In areas with rolling or steep terrain with a coal seam occurring near the top of a ridge of hill, the entire top is removed in a series of parallel cuts. Overburden is disposed in nearby valleys and hollows. This method usually leaves ridges and hill tops as flattened plateaus. The process is highly controversial because of the drastic changes in topography and covering streams and disrupting ecosystem.

2.1.5 Underground mining-

Most coal seams are too deep for opencast mining and require underground mining and this method currently accounts for about 60 % of world coal production. In deep



mining, the room and pillar or bored and pillar method progresses along the seam. The pillars and timbers are left standing to support the mine roof. Once room and pillar mines have been developed have been developed to a stopping point, a supplementary version of room and pillar mining is commonly started. Miners remove the coal in the pillars, thereby recovering as much coal from the coal seam as possible. A work area involved in pillars extraction is called a pillar section. Modern pillar

sections use remote controlled equipment, including large hydraulic mobile roof-supports, which can prevent cave-ins until the miners and their equipment have left a work area. The mobile roof supports are similar to a large dining-room table, but hydraulic jacks for legs. After the large pillars of coal have been mined away, the mobile roof support's leg shortens and it is withdrawn and it is withdrawn to safe area. There are five principal methods of underground mining.

LONGWALL MINING accounts for about 50% of underground



production. The long wall shearer has a face of 300m or more. It is a sophisticated machine with a rotating drum that moves mechanically back and forth across a wide coal seam. The loosened coal falls on to a pan line that takes the coal

to the conveyor belt for removal from the work area. Long wall system has their own hydraulic roof support which advance with machine as mining progresses. As the long wall mining equipment moves forward, overlying rocks that is no longer supported by coal is allowed to fall behind the operation in a controlled manner. The supports make possible high levels of production and safety. Sensors detect how much coal remains in the seam while robotic control enhances efficiency. Long wall systems allow 60-70% coal recovery rate when surrounding geology allows their use. Once the coal is removed, usually 75 percent of the section, the roof is allowed to collapse in a safe manner.

CONTINUOUS MINING utilizes a machine with a large rotating steel drum equipped with tungsten carbide teeth that scrape coal from the seam. Operating in a “room and pillar” system where the mine is divided in to a series of 5-10m rooms or work area cut into coal bed and it can mine as much as five tons of coal per minute, more than a non-mechanized mine would in an entire day. Continuous miners account for about 45% of underground coal production.

Conveyors transport the removed coal from the seam. Remote controlled continuous miners are used to work in a variety of difficult seams and conditions, and robotic versions controlled by computers are becoming increasingly common.



BLAST MINING or conventional mining is an older practice that uses explosives such as dynamite to break up the coal seam, after which the coal is gathered and loaded on to shuttle cars or conveyors for removal to a central loading area. This process consists of a series of operations that begins with cutting the coal bed so it gets break easily when blasted with explosives.

SHORTWALL MINING, a method involves the use of a continuous mining machine with movable roof supports, similar to long wall. The continuous miner shears coal panels 40-60m wide and more than half mile long, having regard to factors such as geological strata.

RETREAT MINING is a method in which the pillars or coal ribs used to hold up the mine roof are extracted allowing the mine roof to collapse as the mining works back towards the entrance. This is one of the most dangerous forms of mining owing to the imperfect predictability of when the ceiling will collapse and possibly crush or trap workers in the time.

The operation of the mine to recover the ore begins and continues as long as the company operating the mine finds it economical to do so. Once all the ore that the mine can produce profitably is recovered, reclamation begins to make the land used by the mine suitable for future use. The nature of the mining process creates a potential negative impact on the environment both during the mining operations and for years after the mine is closed. The impact has led to most of the world's nations adopting regulations to moderate the negative effects of mining operations.

2.2 REGULATIONS FOR MINING PROCESS

The mining segment has separate sets of legislation to govern the management, conservation, grant and operation of mine lease and environmental management. The Mines and Minerals (Development and Regulation) Act, 1952, together with the rules and regulations framed under them, constitute the basic laws governing the mining sector in India. The Mines Act governs the health and safety of workers, while the regulations on mining including grant of lease, royalty, prospecting and conservation are governed by the MMDR Acts. Besides, all mining projects have also to comply with the Forests Conservation Act (FCA) 1980, the Environment Protection Act (EPA) 1986 (and the rules

made thereby), and the Environmental Impact Assessment Notification, 2006.

Broadly speaking there is six main environmental acts applicable on mining industry in India are

✚ The Water (Prevention and Control of Pollution) Act 1974 (amended in 1988) for impacts on water due to

- Residues of explosives induce heavy metal contamination into the surface water bodies through run-offs & ground water.
- Water spraying to reduce the fugitive emissions gets contaminated and finds its way to surface water bodies and ground water.
- Water being used for domestic activities at mining sites is contaminated.

✚ The Air (Prevention and Control of Pollution) Act,1981 (amended in 1988) for impacts on air due to

- Blasting operations give rise to fugitive emissions in form of particulate matter.
- Even manual mining causes fugitive emission, the impact is however less as compared to blasting.
- Increased transport in the region adds to the air pollution in terms of green-house gases and suspended particulate matters.
- Loading/unloading and sizing of mineral at mining site also considerably add to the fugitive emissions, causing air pollution.

- ✚ The Water (Prevention and Control of Pollution) Cess Act, 1977
- ✚ The Environment (Protection) Act, 1986 (with rules 1986 and 1987)
- ✚ The Forest (Conservation) Act, 1980 (amended in 1988)
- ✚ The Wildlife (Protection) Act, 1972 (amended in 1991)

After obtaining clearances under the Forests (Conservation) Act, 1980 & the Wildlife (Protection) Act, 1972, the mining projects are required to obtain prior environmental clearance from the designated authority of Government of India, followed by air/water consent and authorization under hazardous waste rules from the concerned State Pollution Control Board.

2.3 ENVIRONMENTAL LAWS FOR MINING IMPACT

The implementation of environmental laws in mining industry is governed by the conditions imposed in environmental clearance issued by Ministry of Environment and Forests and consent to establish/operate issued by State Pollution Control Board. The compliance status in general for conditions imposed by Ministry of Environment and Forests and SPCB is summarized as below:

Sl. No.	Conditions	Compliance
Ministry of Environment and Forests		
01	Top soil shall be stacked properly in a dump of not more than 06 m height of proper slope at earmarked sites with adequate measure and should be used for reclamation and rehabilitation of mined out area and for green belt development.	Height and slope was not found as per norms
02	External overburden dump shall be not more than 15 m height and OB should be stacked at earmarked	Dumpsites were not found earmarked in most of OC mines. Active overburden

	dump sites only and should not active for long period. Monitoring and management of rehabilitated area should continue until the vegetation becomes self-sustaining.	found in mines of M/S Jindal Steel Pvt. Ltd. Raigarh, CG
03	Construction of Catch drains, siltation ponds, Garland drains and settling pond	Garland drains were not in most of the mines, if constructed found choked.
04	Development of green belt for suppression of dust around the mine lease area and coal handling plant.	Developed green belt was not found and new plantations done may take time to act for suppression of dust
05	Quarterly monitoring of ground water level and quality and submission of data to concerned department	Data is being submitted regularly
06	Providing artificial recharge measures and meeting water requirement of nearby villages in case wells go dry	Water is being supplied to nearby villages by few mines of WCL and SECL however privately owned captive mines are not meeting the requirement of nearby villages.
07	Providing rain water harvesting system	No rain water harvesting in mining area however few were found in office area
08	Provision of high efficiency dust extraction system in coal handling plant	Old and low efficiency only in few mines
09	Providing treatment plant for sewage, workshop and CHP wastewater	Need based treatment plant were provided. Full-fledged treatment plants are provided if water is to be used for company township and in case of its discharge in water body or its use for agricultural purpose only simple tanks are provided in the name

		settling tank
10	Consent to operate from SPCB	Every mines have consent to operate
11	Monitoring of vehicular emission and construction of 4.5 km metal top road	No system was found for vehicular emission monitoring and metal tops roads of required length
12	Establishment of four ambient air quality station for RPM,SO ₂ ,NO _x and CO and submission of data to concerned departments	No fixed monitoring station however data is being submitted regularly
13	Adequate measure for control of noise levels below 85dB(A)	No measures
14	Treatment of industrial wastewater to confirm the prescribed standard	In most of the case out let water quality meets the norms.
15	Treatment and disposal of acidic mine water as per prescribed standards	No acid mine discharge was observed
16	Establishment of Environmental laboratory and environmental management cell	Coal India has constituted separate department named as CMPDI for environment management but its regional laboratories were not found functional.
STATE POLLUTION CONTROL BOARD		
17	Industry shall upgrade/modify the ETP and shall operate/maintain to ensure treated effluent quality within the standards. No treated/untreated effluent shall be discharged outside the mine premises in any circumstances hence zero discharge condition outside the premises shall be maintained at all time.	As above in 09. None of the mines especially captive mines were found complying for zero discharge. Only those mines of Coal India Limited were found observing zero discharge where treated water is very much required for their township.
18	Establishment of environmental laboratory and submission of data on monthly basis	As above in 16
19	All internal roads shall be black	Not complied by any mine

	topped and good house keeping	
20	Coal transport in duly covered conveying system/vehicles to fugitive emission during transportation	Coal was found openly transported in vehicles
21	Industry shall obtain letter of authorization under HWMR	Complied
22	Development of green belt in 33% of the area with in around the premises.	Not fully complied
23	Submission of Environmental statement report on or before 30 th September of every year	Complied

3.1 PERCEPTUAL FACTS FOR PROJECT

Among all fossil fuels, coal has acquired the dubious distinction of being the dirtiest one. Such an attribute is on account of environmental damage and pollution problems caused during mining, processing, and end use wastes of coal. India’s total land area is 3.29 million sq. km and within this only 0.45 % area (16000sq.km) is coal bearing. Out of this coal bearing area, active coal mining area is about 2500 sq. km. Maximum land degradation in coal mining is caused by open cast mining and it is currently confined to 20 % of the coal bearing land and additional area that could be used for open cast mining would be around 5-10 % of the coal bearing land.

Major environmental issues include erosion, formation of sinkholes, and loss of biodiversity and contamination of soil, ground water and surface water by chemicals from mining processes. Besides creating environmental damage, the contamination resulting from leakages of chemicals and vibration form blasting/drilling operations also affect the health of local population. The wastes also impose a considerable impact on the land, air and water components of the environment. Possible events and the expected consequences from various mining operations are as below-

Event	Consequences
Change in land use, land –cover and land form	<ul style="list-style-type: none"> • Disturbance in natural water-sheds & drainage pattern of the region • Disturbance in wind direction, flow

	<p>and temperature</p> <ul style="list-style-type: none"> • Ultimately disturbance in rivers/stream flow, agriculture patterns etc. • Floods and loss of bio-diversity
Release of greenhouse gases like carbon di-oxide and methane due to fracturing of strata and in-situ combustion of coal seams.	<ul style="list-style-type: none"> • Global warming and other related consequences.
Waste products including uranium, thorium and other radioactive and heavy metal contaminations	<ul style="list-style-type: none"> • Air/water/soil/food grain contamination or direct exposure to flora/fauna
Acid rain	<ul style="list-style-type: none"> • Contamination in surface/ground water, soil, agriculture
Acid mine drainage	<ul style="list-style-type: none"> • Contamination in surface/ground water, soil and agriculture
Disturbing recharge area	<ul style="list-style-type: none"> • Interference with groundwater and water table level, surface water
Disturbances in the drainage and water-sheds of surface water bodies	<ul style="list-style-type: none"> • Causing change in flows and discharges of rivers and streams
Dust nuisance due to blasting, drilling and digging	<ul style="list-style-type: none"> • Air pollution health impact and visibility hindrance. • Damage to building and structure.
Subsidence above tunnels	<ul style="list-style-type: none"> • Sometimes damaging the infrastructure.
Rendering land unfit for the other use	<ul style="list-style-type: none"> • Wastage of non-renewable resources
Sizing of coal	<ul style="list-style-type: none"> • Air pollution health impact and visibility hindrance.
Transportation / loading/unloading	<ul style="list-style-type: none"> • Air pollution health impact and visibility hindrance.
Beneficiation of coal	<ul style="list-style-type: none"> • Contamination of surface/ ground water, soil, agriculture • Air pollution health impact and visibility hindrance.

In coal mining major environmental impacts on surroundings are erosion & sedimentation, habitat modification, surface & ground water

contamination and drawdown of ground water. Drawdown is lowering of ground water table by continuous pumping of ground water to prevent ground water seepage in open cast mining. Residues of explosives induce heavy metal contamination in to surface water bodies through run-offs and ground water. Water spraying to reduce the fugitive emissions gets contaminated and finds its ways to surface water bodies. In order to assess the major environmental impacts on surrounding water quality, the project **“Impact of coal mine discharge on surrounding with special reference to heavy metals”** was formulated by CPCB to conduct the study in central zone.

3.2 PROJECT PROFILE

The project was formulated with an objective that seepage water generated in both types of mining is discharged directly or indirectly in to surface water body which may deteriorate its quality. In order to have judicious assessment field survey was planned to know the existence and status of Rivers, lakes and any other surface water body in the mining area. The path of perennial drains with its water use on the way was to be studied to ensure confluence of coal mine discharge in to surface water body of the area. The format for collection of data from operating mines was to be developed to evaluate the quantity of discharge from mining activity. The water samples of mine discharge, ground water in the area and corresponding river was to be collected. The proposed environmental components and parameters to be monitored in water samples are presented in table below.

Environmental Components & parameters		
Environmental sample	Objective	Parameters to be analyzed
Ground water quality	To study the impacts due to leaching of acidic & metal contaminated water generated from tailing and waste rock.	pH, Sulphate, Acidity, Alkalinity, TDS, TSS, Elemental metals, COD, Chloride, Fluoride, Conductance

Surface water quality	To study the impact due to leaching of acetic & metal contaminated water generated from tailing and waste rocks	pH, Sulphate, Acidity, Alkalinity, TDS, TSS, Elemental metals, COD, Chloride, Fluoride, Conductance, COD and BOD
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3.3 METHODOLOGY

The information about each coal mine was collected from various coal mine companies by sending formats (data received has been compiled and presented in Chapter-06). The information received was screened on following parameters-

- I. Coal production capacity of the mine
- II. Nature of mine (UC/UG)
- III. Type of treatment provided
- IV. Place of discharge
- V. Report of ground water quality

Based on screening, list of coal mines to be monitored was prepared giving judicious representation to all above parameters. In order to locate the source of particular pollutants water sampling points were decided and water samples collected form before treatment and after treatment of the waste. The final discharge point of treated effluent was also located and physically verified to layout its further confluence to surface water body like River/lake/agricultural field. In case of River discharge two samples were collected from upstream and downstream of confluence point. In order to evaluate the impact of waste water discharge, ground water samples were also collected. Non conservative parameters like pH, Temperature and dissolved oxygen in River Samples only were analyzed in field whereas conservative parameters were analyzed in the Laboratory of Central pollution Control Board, established at Bhopal using prescribed method as mentioned in table below. All the samples collected in field were preserved as per specified method listed in the table and brought to laboratory with in stipulated time.

-: Test methods and mode of preservation of samples:-

Parameter	Test Method	Preservation
Temperature	APHA 2550 A+B, 2-61 to 2-62, 21 st Ed.2005	Field Parameter
Conductivity	APHA 2510-B, 2-47 to 2-48, 21 st Ed.2005	Ice Cooling
pH value	APHA 4550 H ⁺ -B, 4-90 to 4-94, 21 st Ed.2005	Ice Cooling
Suspended Solids	APHA 2540 D, 2-58, 21 st Ed.2005	Ice Cooling
Total Solids	APHA 2540 B, 2-56, 21 st Ed.2005	Ice Cooling
Total Dissolved Solids	APHA 2540 C, 2-57, 21 st Ed.2005	Ice Cooling/l
Chemical Oxygen Demand (COD)	APHA 5220-B, 5-15 to 5-16, 21 st Ed.2005	H ₂ SO ₄
Biochemical Oxygen Demand (BOD)	APHA 5210-B, 5-2 to 5-7, 21 st Ed.2005 4500 OC, 4-138 to 4-140, 21 st Ed. 2005 IS-3025 part 4;1993 Biochemical Oxygen Demand	Ice Cooling
Dissolved Oxygen	APHA 4500-OC, 4-138 to 4-140, 21 st Ed.2005	Field parameter
Nitrate Nitrogen	APHA 4500-NO ₃ -E, 4-123, 21 st Ed.2005 (Cadmium Reduction Method)	Ice Cooling
Oil and Grease	APHA 5520 D, 5-40, 21 st Ed.2005	H ₂ SO ₄
Sulphate	APHA 4500-SO ₄ ²⁻ -E, 4-188, 21 st Ed.2005	Ice Cooling
Alkalinity	APHA 2320-B, 2-27 to 2-29, 21 st Ed.2005	Ice Cooling
Hardness Total	APHA 2340-C, 2-37 to 2-39, 21 st Ed.2005	Ice Cooling
Fluoride	APHA 4500-F D, 4-82 to 4-83, 21 st Ed.2005 (SPADNS Method)	None
Copper	APHA 3111 A+ B, 3-13 to 3-19, 21 st Ed.2005	HNO ₃ to pH<2
Nickel	APHA 3111 A+ B, 3-13 to 3-19, 21 st Ed.2005	HNO ₃ to pH<2
Lead	APHA 3111 A+ B, 3-13 to 3-19, 21 st Ed.2005	HNO ₃ to pH<2
Iron	APHA 3111 A+ B, 3-13 to 3-19, 21 st Ed.2005	HNO ₃ to pH<2
Cadmium	APHA 3111 A+ B, 3-13 to 3-19, 21 st Ed.2005	HNO ₃ to pH<2
Zinc	APHA 3111 A+ B, 3-13 to 3-19, 21 st Ed.2005	HNO ₃ to pH<2
Chromium	APHA 3111 A+ B, 3-13 to 3-19, 21 st Ed.2005	HNO ₃ to pH<2
Manganese	APHA 3111 A+ B, 3-13 to 3-19, 21 st Ed.2005	HNO ₃ to pH<2

4.1 MONITORING PLAN

In first phase 07 mines of WCL located in PENCH, Pathakheda and Kanhan area of Madhya Pradesh were monitored. In Pathakheda area there are 03 seams at three different depths for which mining activity is done at 08 places. The water being generated in all 08 active (UG) mines are collected at individual mines and allowed for settling at mining place. This water is further pumped to surface i.e. ground level where once again it is settled and part of it is used for gardening and suppression of dust. The balance water is finally discharged into perennial drain which ultimately joins River Tawa after travelling of approximately 7-8 km.

In Kanhan area total 09 mines area active (UG-06 & OC-02) including 01 coal washery. This area is having only one seam of 06 m



thickness with varying depth. Kanhan area is surrounded by River Kanhan which receives all waste water generated from coal mines through various drains. River

Kanhan originates from district Chindwara and meets River Godavari in Maharashtra. There is one more perennial River in this area named as Tamia which ultimately joins River Tawa.

In PENCH area there are 12 mines (OC-04, UG-08) out of which only 09 mines are active. All the waste water generated in coal mines of this area is discharged in River PENCH. The samples of all inlets and outlet of coal mines and upstream/downstream of River were collected.

In second phase another 07 mines of SECL and others in Tamnar, Bishrampur, Chotia, Bhatgaon and Chirmiri area of Chhattisgarh were monitored. The Tamnar area of Chhattisgarh is occupied by captive mines of industries located in Raigarh. There are three OC and one UG

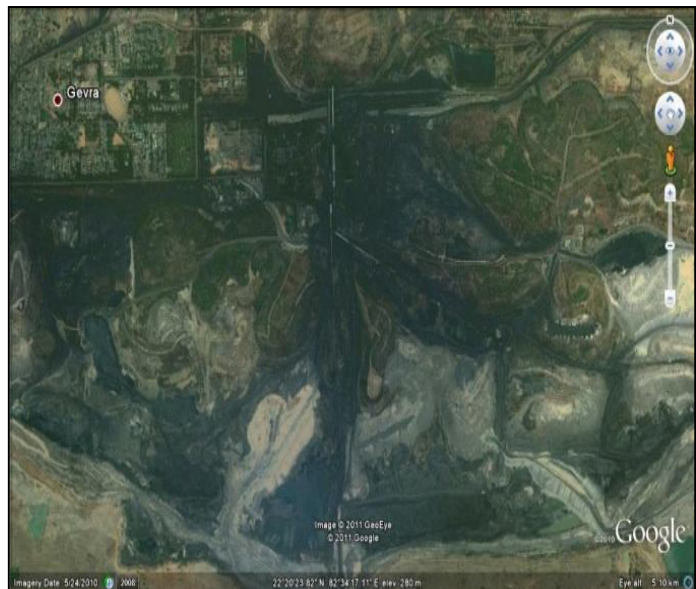
mine in this area and all waste water generated are being discharged in River Kelo through Bendra and Dummnar drain in spite of zero discharge condition imposed by SPCB. SECL also have its mines in Baikunthpur, Bhatgaon,



Bishrampur, Chirmiri, Korba, Kusmunda, Gevra, Dipika and Raigarh area of Chhattisgarh. Four mines of Bishrampur, Bhatgaon and Chirmiri area were monitored. All mine waste water discharge of Bishrampur area joins River Rehar through Passang drain and of Bhatgaon area River

Mahan through massan drain. In view of drinking water shortage in Chirmiri area all mines located there are treating their waste water up to portable quality and using in township. M/s Rani Atari coal mine is one of the best mine of SECL and uses continuous miner (ACM-10) of 60TPH capacity. The waste water generated in this mine is treated up to portable grade and most of it is used for cooling and cutting support of ACM-10. The captive coal mine of M/S Prakash Industries is located in Chotia area of Chhattisgarh state. The open cast mine is being used for production 10 lakh TPA coal form 979 hectare area. The waste water generated in the coal mine is being discharged in to River Hasdeo at 01 km distance.

In third phase coal mines located in Korba area of Chhattisgarh and Sohagpur, Johila areas of Madhya Pradesh were monitored. In Sohagpur and Johila area the coal mines are being operated by SECL and coal production of Sohagpur area 40 lakh ton per annum in 09 active mines. The waste water generated from this area pumped in agricultural fields and major part of it is discharged in River Sone through behla drain. The biggest mine of Johila area is Kanchan open cast and producing 6.1 lakh tons coal per annum. The second mine Vindhya underground is producing 2.4 lakh ton coal per annum. The waste water of all mines of Johila area goes to River Johila through gurchat drain.



4.1 FIELD OBSERVATIONS

The major facts observed during monitoring is as below-

- I. There were no measuring devices installed in coal mines for measurement of waste water generated and discharged.
- II. The SPCB has recommended for zero discharge from all coal mines but in most of mines zero discharge is not complied.
- III. The treatment provided to waste water by coal companies are need based only, wherever waste water is to be used for domestic purpose in townships, it being treated for proper settling followed by pressure filtration.
- IV. In many mines it was found that RCC tanks were provided for settling with low retention time. The waste water being pumped in that tanks are having sufficient pressure for creating turbulence in settling tanks.
- V. Treatment plants of many mines were found very old or over aged and nor fit for its operation especially in underground mines.
- VI. In underground mines the left mined pits are being used as storage pit and claimed as settling pit. This water is pumped to ground level in RCC tanks and over flow is allowed for discharge.
- VII. There were no sludge collection and with drawl system in settling tanks. The fine coal particles flowing in waste water was found deposited in agricultural fields using this water for irrigation.
- VIII. The waste water discharged by mines finds its way in perennial drain and ultimately joins the rivers of that area. The heavier coal particles get settled in way either in RCC tanks or in carrying drain,

but very fine coal particles in suspension decreases the sunlight permeability in River water.

- IX. In case of open cast mines the waste water generated is collected in open pits and pumped in to drains as and when required.
- X. The improper stacking and slope of top soil and overburden increases the possibility of contamination of ground water during rainy season.
- XI. Most of the coal mines have not provided catch drain and catch pits for run-off collection from top soil and over burden stacking.
- XII. Garland drain for management of rain water was found either not constructed and if constructed not maintained properly.
- XIII. Huge deposition of fine coal particles were observed in and around the coal mines on road as well as on tree. This may be due to open transportation of coal in the area. These fine coal particles find its ways to drain and finally to River in rainy season.
- XIV. Unpaved or semi paved roads are being used for vehicular movement in coal mine area whereas as per environmental conditions imposed it should be black topped.

5.1 DATA PRESENTATION

In the course of monitoring water samples were collected from inlet and outlet of ETP in selected mines of particular area. The samples were analyzed for general parameters like pH, Conductivity, Chemical Oxygen Demand (COD), Total Suspended solids, total solids, Fluoride, chloride, Sulphate and Nitrate. Heavy metals like Lead (Pb), Chromium (Cr), Copper (Cu), Nickel (Ni), Cadmium, Zinc (Zn) and Manganese (Mn) were also analyzed on AAS. The analysis results of waste water samples collected from coal mines are presented in Table: 01.

The waste water of coal mines was found being discharged in to drains passing to their nearby areas. Such drains were of two type i.e. perennial drains and flowing drains. The waste water discharged in perennial drains generally do not reach to rivers in summer season but certainly loads all accumulated pollutant in River during rainy season. The flowing drains use to load the pollutants in rivers continuously. In order to find out the pollution load carried by these drains samples were collected and analyzed. The analysis results of drain water samples are presented in Table: 03. The impact of coal mine discharge on ground water and river water was evaluated by collecting the representative samples from Rivers and bore wells. The analysis results of the samples are presented in Table: 02 and 04.

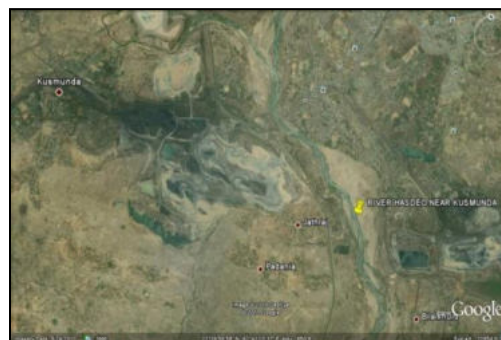


TABLE: 01 ANALYSIS REPORT OF COAL MINE DISCHARGE WATER

Parameters in mg/l except pH and conductivity	LAB CODE	pH	Cond.	COD	TSS	TS	F	Cl	SO4	NO3-N	Zn	Mn
PATHAKHEDA ,PENCH & KANAHN Area –WCL- MADHYA PRADESH												
Sarni mine UG O/L	149	7.74	388	22	7	530	1.364	16	87	--	BDL	BDL
Sarni UG coal mine I/L	150	7.58	719	24	6	501	1.598	16	98	--	0.015	BDL
Chhattarpur–IIUG O/L	151	7.98	1020	24	2	616	1.19	59	136	--	0.018	BDL
Chhattarpur–II UG- I/L	152	8.05	1020	25	5	528	1.016	58	197	--	0.016	BDL
Nandan Washery O/L	158	8.17	2000	32	18	546	1.937	13	82	--	0.013	BDL
Jharna UG Mine I/L	159	8.24	1330	25	5	1510	2.050	74	314	--	0.011	BDL
Jharna UG Mine O/L	160	8.06	1330	23	2	814	1.746	67	304	--	0.016	BDL
16/17Ghorawari I/L	161	7.09	1338	20	2	763	2.042	20	546	--	0.032	1.487
16/17Ghorawari O/L	162	7.86	1320	22	2	1023	2.050	13	508	--	0.058	BDL
Shivpuri OC Mine- I/L	163	7.13	1560	19	5	962	1.642	14	747	--	0.118	0.397
Shivpuri OC Mine O/L	164	7.58	1570	24	7	1097	0.477	16	617	--	0.130	0.396
Mahadeopuri UG I/L	165	8.07	867	23	6	1123	1.242	24	207	--	0.047	BDL
Mahadeopuri UG O/L	166	8.03	821	22	5	632	1.459	17	188	--	0.149	BDL
Rawanwara UG O/L	169	6.96	1830	26	8	1187	0.625	40	749	--	0.126	3.671

CHIRMIRI & BHATGAON AREA- SECL- CHATTISGARH												
Jindal coal mine O/L	244	6.14	249	17.6	20	432	0.06	04	97.1	0.1	0.054	0.372
Monet Coal mine I/L	245	7.64	136	32.4	238	388	0.03	15	33	0.06	0.030	BDL
Monnat coal mine O/L	246	7.29	171	18.8	29	174	0.06	07	16	0.02	0.031	BDL
NecoJayswalmine O/L	247	7.56	199	4.5	75	288	0.06	10	19	0.04	BDL	BDL
NecoJayswal mine I/L	248	7.19	221	12.3	137	324	0.04	23	35	0.09	0.037	BDL
Balrampur mine I/L	250	6.15	537	8.4	06	412	0.08	17	171	0.04	0.040	BDL
Balrampur mine O/L	251	7.03	508	7.8	10	480	0.08	12	166	0.04	0.082	BDL
Bhatgaon mine O/L	256	6.58	420	9.7	11	390	0.29	11	166	0.22	0.141	0.982
Parameters are in mg/l except pH and conductivity	LAB CODE	pH	Cond.	COD	TSS	TS	F	Cl	SO4	NO3-N	Zn	Mn
NCDH Chirmiri O/L	257	6.99	463	5.8	13	436	0.32	14	165	0.12	0.027	BDL
Rani Atari mine O/L	260	7.05	213	10.4	12	182	0.30	08	17.9 8	0.05	0.074	BDL
Prakash Coal mine O/L	261	6.60	436	7.8	06	236	0.16	18	9.90	0.07	0.014	BDL
KORBA AREA- SECL- CHATTISGARH												
Rajgamar UG O/L	267	6.41	245	6	13	294	0.10	15	86	0.10	0.068	1.156
Surakachhar UG O/L	270	5.92	238	21	54	295	0.15	21	14	0.15	0.014	BDL

Dipka OC mine O/L	271	7.08	572	20	35	598	0.32	47	150	0.32	0.019	BDL
Gerva Mine O/L	272	5.92	334	7	35	383	0.20	23	141	0.20	0.088	0.450
Gerva workshop O/L	273	5.02	273	8	44	329	0.32	09	94	0.32	0.030	BDL
Kusmunda mine O/L	275	6.63	296	30	44	383	0.26	22	75	0.26	BDL	BDL
Kusmunda workshop O/L	276	6.03	246	11	47	280	0.38	19	75	0.38	0.074	BDL
SOHAGPUR AREA – SECL – MADHYA PRADESH												
New Amlai UG O/L	296	6.89	1670	15	39	1250	0.54	--	75	0.039	0.500	3.835
Dhanpuri UG mine O/L	297	7.42	828	06	12	700	0.44	--	35	0.051	0.013	0.706
Dhanpuri UG O/L	298	7.01	356	09	21	265	0.32	--	05	0.044	0.058	BDL
Amlai OC Mine O/L	299	7.07	1550	08	78	1150	0.58	--	65	0.047	1.533	12.93
Kanchan OC Mine O/L	300	8.46	752	09	15	681	1.19	-	20	0.045	BDL	BDL
Vindhya OC Mine OF/L	301	6.78	1390	05	09	1264	0.76	--	33	0.035	BDL	BDL
LIMITS		5.5-9.0		250	100	1500	02	600	400	10	05	02

Note: Limits are as per MOEF Gazette Notification No. GSR 742 (E) dt. 25.09.2000. Pb, Cr, Cu, Ni and Cd were also analyzed but found below detection limit

TABLE: 02 ANALYSIS REPORT OF GROUND WATER

Parameters are in mg/l except pH and conductivity	LAB CODE	pH	Cond	COD	TSS	TS	F	Cl	SO4	NO3-N	Zn	Mn
CHIRMIRI & BHATGAON AREA-SECL – CHATTISHGARH												
G.W. Balrampur	252	6.37	207	5.1	23	234	0.22	04	13.78	0.004	BDL	BDL
G.W. Chirmiri	258	6.92	406	4.3	16	230	0.49	10	05.99	0.08	0.309	BDL
G.W. Chotia	263	6.20	296	12.1	38	266	1.09	12	10.98	BDL	--	--
SOHAGPURAREA– SECL – MADHYA PRADESH												
Johila Area Tube well (G.W)	302	7.35	591	02	22	554	1.1	22	05	0.09	0.440	BDL
LIMITS		5.5-9.0	---	---	---	---	1.5	250	250	45	05	0.1

Note: Limits are as per IS-10500. Pb, Cr, Cu, Ni and Cd were also analyzed but found below detection limit

TABLE: 03 ANALYSIS REPORT OF DRAIN WATER

Parameters are in mg/l except pH and conductivity	LAB CODE	pH	Cond	COD	TSS	TS	F	Cl	SO4	NO3-N	Zn	Mn
PATHAKHEDA ,PENCH&KANAHN Area –WCL- MADHYA PRADESH												
Takiya Nalla	157	7.89	802	30	6	185	1.251	82	268	0.19	0.035	BDL
CHIRMIRI & BHATGAON AREA- SECL- CHATTISGARH												
Passang drain	253	6.24	338	13.9	99	458	0.26	23	10.4 4	0.16	0.13	0.73
West Chirmiri Drain	259	7.21	616	5.8	78	582	0.91	09	255	0.63	--	--
Prakash drain B/C Parla Nalla	262	6.35	985	14.9	08	468	0.24	30	318	0.5	BDL	BDL
Parla Drain at Kasawadi village	265	6.82	942	17.8	15	860	0.41	48	384	0.91	--	--
KORBA AREA- SECL- CHATTISGARH												
Dengur Nalla	274	6.06	255	16	353	652	--	32	17	--	0.02	BDL
SOHAGPUR AREA-SECL- MADHYA PRADESH												
Umaria Nalla (Johila area)	303	8.24	457	06	31	464	--	42	02	0.85	BDL	BDL
Gndehhat Nalla	304	8.25	363	03	35	390	--	26	01	0.72	BDL	BDL
LIMITS		5.5- 9.0	--	250	100	---	2	---	---	--	05	02

Note: Standards are as per guidelines for discharge in drain. Pb, Cr, Cu, Ni and Cd were also analyzed but found below detection limit

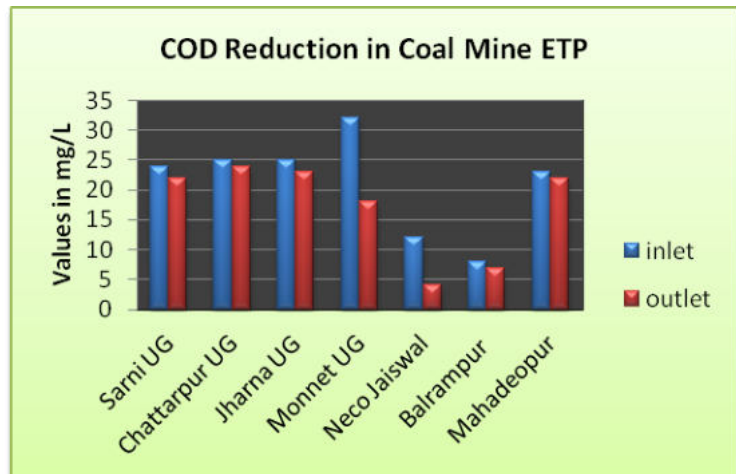
TABLE: 04 ANALYSIS REPORT OF RIVER WATER

Parameters are in mg/l except pH and conductivity	LAB CODE	pH	COND	COD	TSS	TS	F	Cl	SO4	NO3-N	Zn	Mn
PATHAKHEDA ,PENCH & KANAHN Area –WCL- MADHYA PRADESH												
D/S Tawa River	153	7.97	245	19	8	54	0.269	10	4	--	0.019	BDL
U/S Tawa River	154	7.85	195	21	6	86	1.607	07	3	--	BDL	BDL
U/S Kanhan River	155	8.60	224	20	2	36	0.947	10	15	--	BDL	BDL
D/S Kanhan River	156	7.81	402	22	9	162	1.485	14	17	--	BDL	BDL
D/S PENCH River	167	8.03	427	20	9	237	1.485	07	22	--	0.022	BDL
U/S PENCH River	168	8.32	472	19	17	321	0.295	08	56	--	0.025	BDL
CHIRMIRI & BHATGAON AREA- SECL- CHATTISGARH												
River Kelo D/S	249	7.16	266	16.6	12	240	0.07	14	57.94	0.07	BDL	BDL
River Rehar A/C passang drain	254	6.70	269	12.5	97	288	0.26	03	78.52	0.83	0.067	0.434
River Mahan A/C massan drain	255	7.27	146	5.8	19	152	0.20	05	06.59	0.07	BDL	BDL
River Hasdeo Near Korbi bridge	264	7.76	268	13.9	05	224	0.12	09	32.56	0.02	--	--
River Hasdeo near Kasawadi village	266	7.04	969	15.8	11	120	0.10	04	07.39	0.04	--	--
SECL,KORBA AREA GENERAL PARAMETERS												
Hasdeo River at rail Bridge Korba	277	6.44	194	3	146	343	--	17	20	0.09	0.021	BDL

Pb, Cr, Cu, Ni and Cd were also analyzed but found below detection limit

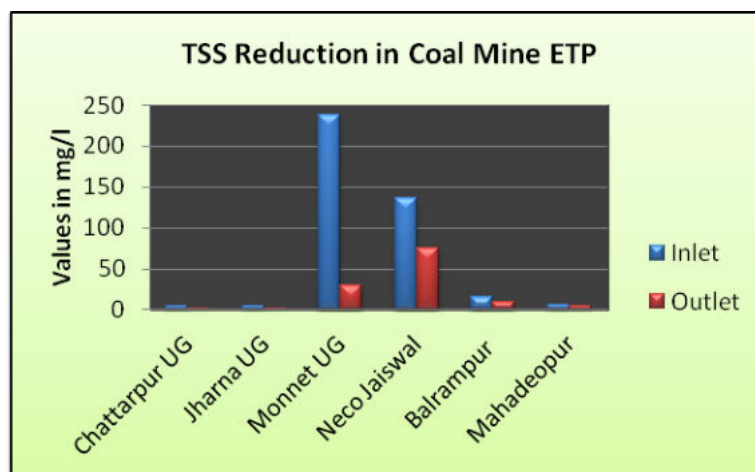
5.2 DATA INTERPRETATION

- I. The chemical oxygen demand (COD) concentration in the discharge of coal mine was found varying from 08-32 mg/l, which is not much high but COD concentration after treatment remains in range of 4.5-26 mg/l. It indicates that performance



efficiency of treatment plant is not very good and varies from 18-43 percent only.

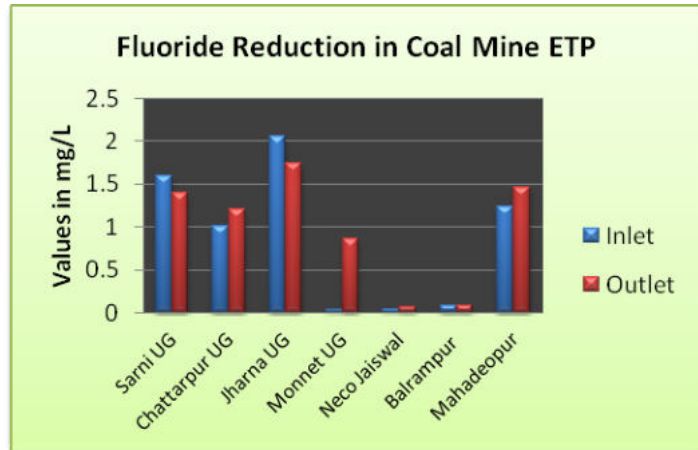
- II. The solids concentration in coal mine waste water was found varying randomly. The inlet water indicates TSS concentration



from 2-238 mg/l and TS concentration from 280-1123 mg/l. As a result of poor treatment the concentration of solids have not came much down. Hence TSS concentration in outlet was found in

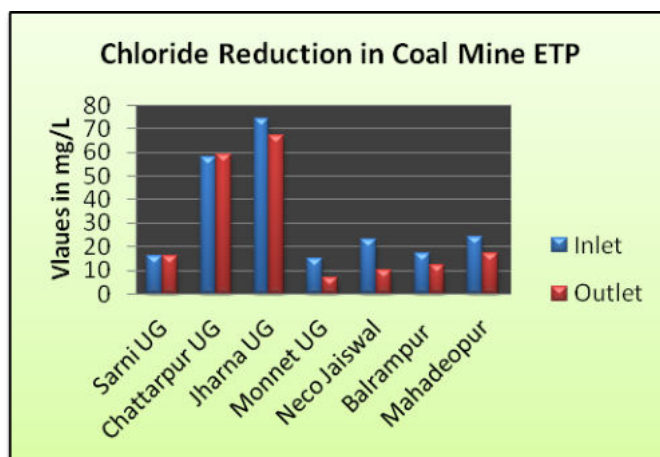
range of 2-75 mg/l and TS concentration in range of 182-1264 mg/l. The overall TSS reduction performance was found to a level of 68% only.

III. Fluoride was found to be one of the hazardous parameters exceeding several times the prescribed limit. The concentration of fluoride was found in the range of 0.30-2.05 mg/l in



inlet of coal mine discharge whereas 0.10-2.05 mg/l in outlet of coal mines discharge. The percent removal efficiency was also found very poor as inlet and outlet concentrations were near about same.

IV. As far as concentration of chloride is concern it was not found



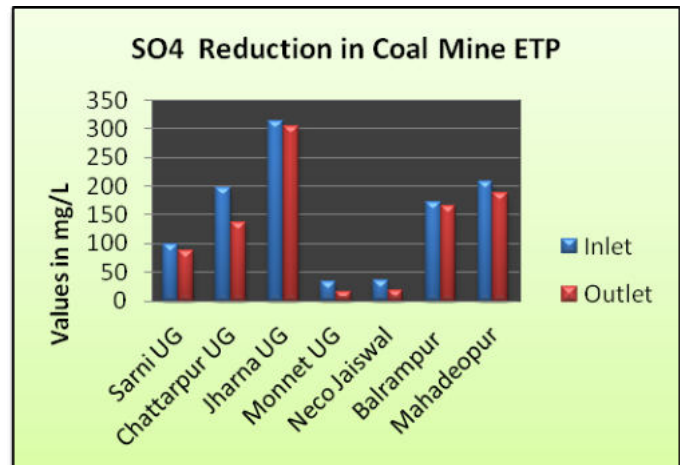
very high but percent removal was

between 10-42% only. The concentration varied in the range of 07-74 mg/l in inlet and 04-67 mg/l in outlet. The maximum concentration of chloride in the effluent of coal mines was found in the mines of WCL located in Pathakheda, PENCH and Kanhan

area of Madhya Pradesh. The area is well known for dense forest and wild life animals in the state.

- V. The concentration of Sulphate was found exceeding the limits in Ghorawari, Shivpuri and Mahadeopuri mines of WCL. The Sulphate

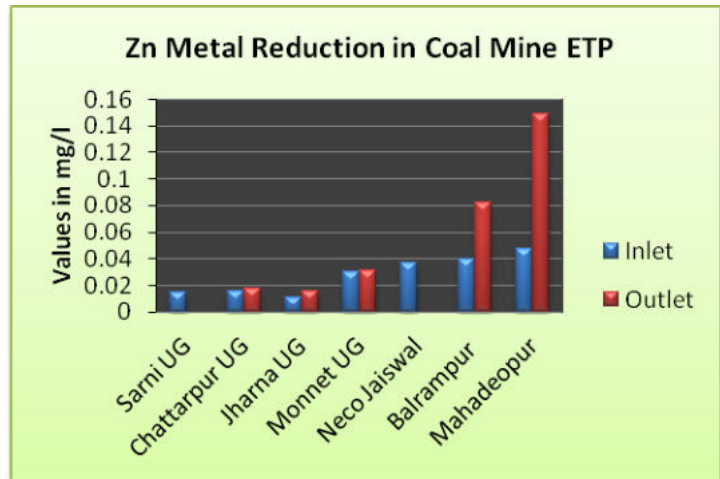
concentration in discharge was found varying from 33 to 747 mg/l at inlet point but 05 to 749 mg/l at ETP outlet point. The treatment provided to



this type of effluent is settling only which seems to be inadequate for this parameter. The overall reduction of Sulphate from inlet to outlet treatment was found to be 17- 35 percent only.

- VI. The nitrate concentration in waste water of coal mine found very less and at point exceeded the prescribed limit. The minimum and maximum range of nitrate was between 0.035-0.038 mg/l in inlet whereas in out let it was 0.032-0.035 mg/l.
- VII. The heavy metal analysis was done for seven metals like Lead, Chromium, Copper, Nickel, Cadmium, Zinc and Manganese. Only two metals was zinc and manganese were found present in coal mine effluent and concentration of other metals were found below detection limit. The concentration of Zinc at inlet point varied between 0.011-0.118 mg/l and outlet point between 0.011-1.53 mg/l but never crossed the prescribed limits. The highest concentration of Zn was found in the outlet of M/s Amlai OC mine

of SECL located in Sohagpur area of Madhya Pradesh. As settling only is not the appropriate method for heavy metal removal, so at many time it was



found that outlet concentration was more than inlet concentration.

- VIII. The concentration of Manganese at inlet point varied between 0.39-1.487 mg/l and outlet point between 0.37-12.93 mg/l and crossed the prescribed limits. The highest concentration of Mn was found in the outlet of M/s Amlai OC mine (12.93), M/s New Amlai OC mine (3.835) of SECL located in Sohagpur area and M/s Rawanwara UG mine of WCL in Kanhan area of Madhya Pradesh. As settling only is not the appropriate method for heavy metal removal, so at many time it was found that outlet concentration was more than inlet concentration.
- IX. The samples of cyanide were also collected from outlet points of mines and analyzed qualitatively but found absent in all samples, hence quantitative analysis have not been performed.
- X. In order to find out impact of coal mines discharge on ground water the samples were collected in every area representing the location of coal mines. The samples were analyzed and results are presented in Table: 02. The data reveals about no impact on ground water as no parameter has crossed the drinking water

prescribed limits. The COD values were found between 02-12.1 mg/l and total solids 230-554 mg/l. The fluoride concentration varied between 0.22-1.09 mg/l and Sulphate 05-13.78 mg/l. The heavy metal contamination was also not found to considerable extent, only Zn was found between BDL-0.440 mg/l and manganese to below detection level.

- XI. The comparison of coal mine effluent data and drain water analysis data established the discharge of coal mine effluent in to drains. As most of these drains are of perennial nature, its impact on River could not be observed but its use for irrigation and animal consumption could not be ruled out. The COD values of drain water varied between 03-30mg/l and TSS 06-353 mg/l. The chloride concentration in drains was found ranging from 09-82 mg/l and Sulphate from 01-384 mg/l. The presence of fluoride in coal mine discharge was reflected in Takiya Nala of Pathakheda area where its concentration was found up to 1.25 mg/l. The overall concentration of Fluoride in the drains varied between 0.24- 1.25 mg/l. The metal concentration in drain water was found well in limit and concentration of Zinc varied from 0.02-0.13 mg/l and Manganese BDL- 0.73 mg/l. The flows observed in the drains indicate the possibility of contamination in receiving water body.
- XII. The impact of coal mine discharge in surface water quality cannot be ruled out as observed concentrations of various parameters are not satisfactory. The fluoride concentration in River Tawa, Kanhan and Pench was found to a high level of 1.607, 1.485 and 1.485 mg/l respectively. The fluoride concentration in the Rivers of Chirmiri, Bhatgaon and Korba areas of Chhattisgarh were found

well in limit and varied from 0.07-0.26 mg/l. The COD values in all rivers monitored were found between 03-22 mg/l and TSS concentration from 2 to 97 mg/l. The TSS concentration in Hasdeo River at Korba was found to 146 mg/l, this is may be because of ash pond over flow discharge of several thermal powers of that area. The chloride concentration in all rivers monitored was not above the required limits and values varied between 03-17 mg/l. Similarly Sulphate concentration was also found varying between 03-78 mg/l and nitrate from 0.02 to 0.83 mg/l. The DO concentration in River was between 05-11 mg/l.

- XIII. As the main focus of the project was to know the impact of heavy metals in surface water quality, all seven metals were analyzed in the River water samples. Out of seven total five metals i.e. Lead, Chromium, Copper, Nickel and Cadmium was found below detection limit. The concentration of other two metals namely Zinc and Manganese were also found very less and varied between 0.019-0.067 mg/l.

5.3 OUTCOME OF PROJECT

The project was executed with objective to evaluate the impact of coal mine discharge on surroundings in special reference to heavy metals. The complete study reveals the following outcomes.

- I. The impact of coal mine discharge on surroundings could not be ruled out.

- II. The mine waste water used for irrigation has given an impact of fine coal particle deposition in agricultural fields.
- III. The fine coal particles coming in mine discharge are increasing turbidity of River water flowing very near to mine area as in case of River Kelo and River Rehar in Raigarh area of Chhattisgarh.
- IV. The fluoride present in ground water is going to Rivers through effluent of coal mines.
- V. Increasing the dependency of villagers on coal mine discharge water by reducing ground water table in the area.
- VI. Increasing metal concentration in River water especially in non-monsoon period.
- VII. Decreasing plantation growth in the area by emitting fine particles during its transportation.

5.4 RECOMMENDATIONS

- I. Strict compliance of zero discharge condition.
- II. Complete treatment of industrial wastewater to confirm the prescribed standard and its in house use.
- III. The treated water quality norms shall be stringent up to portable water norms.
- IV. Providing water meters to measure quantity of waste water generation and discharge

- V. Construction of Catch drains, siltation ponds, Garland drains and settling ponds.
- VI. Providing artificial recharge measures, rain water harvesting system and meeting water requirement of nearby villages by permanent water supply system.
- VII. All internal roads shall be black topped and good housekeeping shall be maintained
- VIII. Coal shall be transported in duly covered conveying system/vehicles to control fugitive emission during transportation.
- IX. The coal mines shall develop thick green belt around the leased mine area.
- X. Top soil and overburden stacking shall strictly follow the norms of its height and slope.

5.5 ACTION PLAN FOR IMPLEMENTAION

State Pollution Control Boards may be asked to direct all coal mines for submitting time bound action plans for implementation of recommendations and its further follow-up.

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL - Deepika Area, Korba (C.G)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Dipka Expansion project, post – dipka Distt.- Korba Chhattisgarh
2	Year of Commissioning	1992 (Coal production started)
3	Name of official coordinating environmental related activity with address, email –ID and phone number	S.K Malviya , Nodal Officer (Env.), Dipka Project Distt.- Korba Ph. No. -07815-263023
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	529.52 million tons as on 01.04.10
6	Present production rate (tons/day)	64507 tons/day(Avg.) as on 21.11.10
7	Expected active life of mine (in year)	21 year
8	Characteristic of coal and its calorific value	F, grade calorific value-4000 kilo cal/kg of coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	2364 KLD(July-October2010) (A) Mine water is allowed to settle in the quarry pit and sedimentation pond before discharge natural streams. (B) 91 KLD reduced in comparison to 2009-10 (C) Two nos. (D) Lilagarh river
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	07 nos. (A) Water spraying id done by mobile water tanker (B) Natural slope drainage

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL - Gevra Open cast (Expansion), Korba (C.G)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Gevra open cast project (Expansion) District of C.G.
2	Year of Commissioning	March 1982
3	Name of official coordinating environmental related activity with address, email –ID and phone number	I. S. Dhillon, Sr. Manager Post- Gevra project , Distt.-Korba C.G.
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	975.00MT
6	Present production rate (tons/day)	98000 Tons/day
7	Expected active life of mine (in year)	29 years
8	Characteristic of coal and its calorific value	Non Cooking coal – M- Moisture(6.3), A- Ash(37.15),VM-Volatile Matters (36.4),FC-Fixed carbon (31.15),Hg- Mercury-(0.58),UHV-Useful heat value-(2903),Grade-“F”.
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	22432(KL/day)
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	01 Yes

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- BANKI COLLIERY KORBA (C.G)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Banki Colliery, P.O. Banki Mongra Distt-Korba,(C.G) -495447
2	Year of Commissioning	16.01.1963
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sh. T. Jeevan, Sr. Manager P.O. Banki Colliery Distt. – Korba (C.G)-495447 Ph. No.-07815 209508
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	3.851 MT
6	Present production rate (tons/day)	700 Ton
7	Expected active life of mine (in year)	07 years.
8	Characteristic of coal and its calorific value	Gr."B" & Gr. " C"
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	30% of mine discharge water is used for drinking water after treatment. No. 05 NO.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Sprinkler provided Provided.

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- DHELWADIH PROJECT, KORBA

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Dhelwadi Project, North East part of Korba, Katghora, DLH, Korba,C.G.
2	Year of Commissioning	1992
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sh. A.K. Jha, Sr.Manager P.O. Katghora, Distt.Korba (C.G.), Ph. No.-07815-277278
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	11.3 Million Tons
6	Present production rate (tons/day)	600 Tons/day
7	Expected active life of mine (in year)	30 years
8	Characteristic of coal and its calorific value	Non coking coal grade “B” Calorific value- 5600 cal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	1745 KLD Water treated through, settling tank and rapid gravity filter with chemical by alum and bleaching powder. N-A Two
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Yes There is Kachha drain for rain water discharge in coal handling yard

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- SINGHALI PROJECT, KORBA

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	SINGHALI Project, North Eastern part of Korba, C.G
2	Year of Commissioning	1993
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sh. A.K. Jha, Sr.Manager P.O. Katghora Distt.- Korba (C.G.) Ph. No.-07815-277278
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	12 Million Tons
6	Present production rate (tons/day)	1000 Tons/day
7	Expected active life of mine (in year)	30 years
8	Characteristic of coal and its calorific value	Non coking coal grade "B" Calorific value- 5600 cal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	1530 KLD Water treated through, settling tank and Filter. N-A One
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Yes In coal handling yard sprinklers has been provided to suppress the dust. No surplus water formed is CHP ,drainage for rain water discharge.

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- BAGDEVA PROJECT, KORBA

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	BAGDEVA Project, North East part of Korba, C.G.
2	Year of Commissioning	1997
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sh. A.K. Jha, Sr.Manager P.O. Katghora, Distt.-Korba (C.G.) Ph. No.-07815-277278
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	12.375 Million Tons
6	Present production rate (tons/day)	1600 Tons/day
7	Expected active life of mine (in year)	15 years
8	Characteristic of coal and its calorific value	Non coking coal grade “B” & “C” Calorific value-5600 To 5900 cal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	493 KLD Settling tank and filter gravity filter with chemical by alum and bleaching powder. N-A One Discharge water is being used offer treatment for self industrial use and supplied near for their uses.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Yes sprinkler system has been provided for pollution control/dust suppression. Pakka / Kachha drain for rain water discharge from coal handling yard

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- Rajgamar Project –Korba

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Rajgama Project Korba SECL
2	Year of Commissioning	1974
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sh. A.K. Sinha Sr. Manager Ph. No. -07759-208808
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	7.375Million Tons
6	Present production rate (tons/day)	568 TPD (Approx.)
7	Expected active life of mine (in year)	30 yrs.
8	Characteristic of coal and its calorific value	Grade “B” (L.F),CV= 5760-6375Cal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	3850 KL/day Settling tank of Pawan Incline. 1150KL/D (Industrial and domestic use) 03 Nos. Phulakdi nalla & Gorma Nalla which are tributary to hasdeo.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	N-A

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- BHATGAON AREA (M.P)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Durga OCM,SECL
2	Year of Commissioning	1.1.1989
3	Name of official coordinating environmental related activity with address, email –ID and phone number	G. K. Rai N.O. (Env.) Ph. 07775-278346
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	2.20 MT
6	Present production rate (tons/day)	1500TPD
7	Expected active life of mine (in year)	3 yrs.
8	Characteristic of coal and its calorific value	“B” 5800Kcal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	700 KL/day Yes Sedimentation pond 1 No. Local Nallah
10	Details of Coal handling Yard (A) If pollution control facilities 1provided (B) Drainage and discharge	2 nos in mine premises Yes.

Note: Mine is located about 42 Km from Ambikapur distt.HQ of Sarguja.

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- BHATGAON AREA (M.P)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Nawapura U.G
2	Year of Commissioning	21.05.2006
3	Name of official coordinating environmental related activity with address, email –ID and phone number	G. K. Rai N.O. (Env.) Ph. 07775-278346
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	6.81 MT
6	Present production rate (tons/day)	700TPD
7	Expected active life of mine (in year)	22 yrs.
8	Characteristic of coal and its calorific value	“B” 5600Kcal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	2000 KL/day Yes Settling Tank Used for Agriculture purpose
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	1 nos in mine premises Yes. Yes.

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- BHATGAON AREA (M.P)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Bhatgaon U/G,SECL
2	Year of Commissioning	1.11.1977
3	Name of official coordinating environmental related activity with address, email –ID and phone number	G. K. Rai N.O. (Env.) Ph. 07775-278346
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	5.81 MT
6	Present production rate (tons/day)	1300 TPD
7	Expected active life of mine (in year)	13 yrs.
8	Characteristic of coal and its calorific value	"B" 5800Kcal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	Nil All mine waste is used for industrial and drinking purpose.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	1 No in Sprinkling. Yes.

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- BHATGAON AREA (M.P)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Kalyani U/G SECL
2	Year of Commissioning	1.1.1995
3	Name of official coordinating environmental related activity with address, email –ID and phone number	G. K. Rai N.O. (Env.) Ph.07775-278346
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	2.63MT
6	Present production rate (tons/day)	250TPD
7	Expected active life of mine (in year)	21 yrs.
8	Characteristic of coal and its calorific value	"B" 5600 Kcal/Kg.
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	750 KL/day Settling tank Local Nallah.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	1 No. yes yes

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- BHATGAON AREA (M.P)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Shivani U/G SECL
2	Year of Commissioning	19.1.1999
3	Name of official coordinating environmental related activity with address, email –ID and phone number	G. K. Rai N.O. (Env) Ph. 07775-278346
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	9.50 MT
6	Present production rate (tons/day)	900TPD
7	Expected active life of mine (in year)	24 yrs.
8	Characteristic of coal and its calorific value	"C" 5200 Kcal/Kg.
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	750 KL/day Settling tank Local Nallah.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	1 No. yes yes

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

SECL- BHATGAON AREA (M.P)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Mahamaya U/G SECL
S.NO.	PARTICULARS	DETAILS
2	Year of Commissioning	1.1.1993
3	Name of official coordinating environmental related activity with address, email –ID and phone number	G. K. Rai N.O. (Env.) Ph. 07775-278346
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	13.75 MT
6	Present production rate (tons/day)	1000 TPD
7	Expected active life of mine (in year)	24 yrs.
8	Characteristic of coal and its calorific value	"B" 5600 Kcal/Kg.
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	1750 KL/day Local Nallah.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	1 No. yes yes

Note: Mine is located 33 Km for distt. H.Q

1	Name of the coal mine location details	Ganapati UG, Pench area ,WCL PO. Parasia, Distt.- Chindwara (MP)
2	Year of Commissioning	1986
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub Area manager& N.O. (Env.)Pench Area. 07161-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	1.63 Million Tons(Approx.)
6	Present production rate (tons/day)	275 TPD
7	Expected active life of mine (in year)	14 yrs.
8	Characteristic of coal and its calorific value	“C/D “
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	Nil Sedimentation by sump in mine. N-A N-A There is no discharge.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling limited to storage only Suppression arrangement provided

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

WCL- MAHADEO PURI UG PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	MAHADEOPURI UG PENCH area
2	Year of Commissioning	1989
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub Area manager& N.O. (Env.)PENCH Area. 07161-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	2.91 MT
6	Present production rate (tons/day)	225 TPD
7	Expected active life of mine (in year)	17 yrs.
8	Characteristic of coal and its calorific value	“C/D” Grade coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	80 KLD Initial sediment in mine sumps and after pump out 10 01
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Initial sediment in mine sumps and after pump out

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

WCL- RAWANWARA KHAS UG PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Rawanwara Khas UG, PENCH Area (M.P)
2	Year of Commissioning	1943
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub Area manager& N.O. (Env.) PENCH Area. Ph. 07161-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	08 Million Tons (approx.)
6	Present production rate (tons/day)	240TPD
7	Expected active life of mine (in year)	35 years.
8	Characteristic of coal and its calorific value	C/D grade coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	400KLD Initial sediment in mine sumps and after pump out for sec. treatment. 50 KLD 01 no. Seasonal Nallah Drinking water & mine water discharge report are normal.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Initial sediment in mine sumps and after pump out

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

WCL- VISHNUPURI –I UG PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	VISHNUPURI-I UG, P.O. Persia, Distt. Chindwara (M.P)
2	Year of Commissioning	1992
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub area Manager, Shivpuri Sub Area, Ph.No.0761-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	7.77 Million Tons
6	Present production rate (tons/day)	160 TPD
7	Expected active life of mine (in year)	25 Years
8	Characteristic of coal and its calorific value	C/D Grade coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	Initial sedimentation was in mine sump thereafter it was pumped out on surface for sec. treatment. NIL N-A Seasonal nallha (During monsoon)
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling is limited to storage only. Suppression arrangement provided.

CENTRAL POLLUTION CONTROL BOARD
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NARTH T.T NAGAR, BHOPAL-462003

WCL- VISHNUPURI –II UG PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	VISHNUPURI-II UG, P.O. Parsia, Distt. Chindwara (M.P)
2	Year of Commissioning	1986
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub area Manager, Shivpuri Sub Area, Ph.No.0761-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	10.05 MT
6	Present production rate (tons/day)	250 TPD
7	Expected active life of mine (in year)	39 years
8	Characteristic of coal and its calorific value	C/D grade Coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	Initial sedimentation was in mine sump thereafter it was pumped out on surface for sec. treatment. NIL N-A Seasonal nallha (During monsoon)
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling is limited to storage only. Suppression arrangement provided.

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

WCL- THESGORA- UG PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Thesgora UG, PENCH area WCL, P.O. : Palatwara, Distt: Chindwara (M.P.)
2	Year of Commissioning	1993
3	Name of official coordinating environmental related activity with address, e mail –ID and phone number	Sub area Manager PENCH area WCL, P.O. : Palatwara, Distt: Chindwara (M.P.) Ph. No.-07161-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	28.15 MT
6	Present production rate (tons/day)	300 TPD
7	Expected active life of mine (in year)	49 Years
8	Characteristic of coal and its calorific value	C/D Grade Coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge (E) Analysis report of waste water before and after treatment (to be enclosed)	NIL Initial sedimentation was in mine sump thereafter it was pumped out on surface for sec. treatment. NIL N-A Seasonal nallha (During monsoon),(E)- there is no discharge at present
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling is limited to storage only. Suppression arrangement provided.

CENTRAL POLLUTION CONTROL BOARD
CENTRAL ZONAL OFFICE, SHAKAR BHAWAN
NARTH T.T NAGAR, BHOPAL-462003

WCL- MATHNI- UG PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	MATHNI UG, Pench area WCL, P.O. : Palatwara Distt: Chindwara (M.P.)
2	Year of Commissioning	1993
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub area Manager Pench area WCL, P.O. : Palatwara, Distt: Chhindwara (M.P.) Ph. No.-07161-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	12.63 Million Tons (approx)
6	Present production rate (tons/day)	350 TPD
7	Expected active life of mine (in year)	25 Years
8	Characteristic of coal and its calorific value	C/D Grade Coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge (E) Analysis report of waste water before and after treatment (to be enclosed)	NIL Initial sedimentation was in mine sump thereafter it was pumped out on surface for sec. treatment. NIL N-A Seasonal nallha (During monsoon),(E)- there is no discharge at present
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling limit to storage only. Suppression arrangement provides. (B) NIL

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WCL-NAHERIYA - UG PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	NAHERIYA, Pench area WCL, P.O. : Palatwara, Distt: Chhindwara (M.P.)
2	Year of Commissioning	2000
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub Area Manager , Distt. Chindwara (M.P.) Ph. No. -07161-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	12.66 MT (Approx.)
6	Present production rate (tons/day)	650 TPD
7	Expected active life of mine (in year)	45 Years
8	Characteristic of coal and its calorific value	D grade Coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	120 KLD (Avg.) Initial sedimentation was in mine sump thereafter it was pumped out on surface for sec. treatment. 20 KLD 01 No. Seasonal Nallah .
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling limit to storage only. Suppression arrangement provided. (B) NIL

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WCL- SHIVPURI-OC PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	SHIVPURI OC, PENCH AREA P.O. PARASIA, DISTT. CHHINDWARA (M.P)
2	Year of Commissioning	2008
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Area Nodal Officer (Env.) PENCH AREA Ph. No. 07161-20058
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	2.20 Million Tons (Approx.)
6	Present production rate (tons/day)	1200 TPD
7	Expected active life of mine (in year)	4 Years
8	Characteristic of coal and its calorific value	C/D Grade Coal.
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	NIL Initial sedimentation was in mine sump thereafter it was pumped out on surface for sec. treatment. NIL NIL N-A No discharge of water from mine.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling limited to storage only. Suppression arrangement provided. (B) NIL

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WCL- URDHAN-OC, PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Urdhan OC, PENCH Area, WCL P.O.-Parasia, Distt.- Chhindwara(M.P
2	Year of Commissioning	Mine yet to start.
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Area Nodal Officer (Env.) Ph. No. 07161-20058
4	Present status of mine whether active or closed	Mine yet to start
5	Total coal reserve (in million tons)	8.66 MT
6	Present production rate (tons/day)	-----
7	Expected active life of mine (in year)	19 Years
8	Characteristic of coal and its calorific value	E- Grade Coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	NIL No discharge of water from coal mine
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling limit to storage only. Suppression arrangement provided. (B) NIL

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WCL-BARKUHI-OC, PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Barkuhi OC, PENCH Area, WCL P.O. Barkuhi, Distt.- Chindwara (M.P)
2	Year of Commissioning	2008
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub Area Manager, Newton Sub Area Ph.No.07161-20058
4	Present status of mine whether active or closed	Presently not working
5	Total coal reserve (in million tons)	2.66 MT
6	Present production rate (tons/day)	---
7	Expected active life of mine (in year)	20 Years
8	Characteristic of coal and its calorific value	E grade Coal
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	NIL NIL Initial sedimentation was in mine sumps , thereafter it is pumped out on surface for sec. treatment. presently no pumping NIL NIL N-A No discharge of water from mine.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling limited to storage only. Suppression arrangement provided.

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WCL- CHHINDA-OC, PENCH AREA (MP)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	CHHINDA OC, PENCH Area, P.O. Chhinda , Distt.- Chhindwara (M.P)
2	Year of Commissioning	2008
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sub Area Manager Rawanwara /Chhinda , Ph .No.-07161-20058
4	Present status of mine whether active or closed	Presently not working
5	Total coal reserve (in million tons)	4.10 Million Tons
6	Present production rate (tons/day)	-----
7	Expected active life of mine (in year)	24 Years
8	Characteristic of coal and its calorific value	D/E grade
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge (E) Analysis report of waste water before and after treatment (to be enclosed)	NIL NIL Initial sedimentation was in mine sump; thereafter it is pumped out on surface for sec. treatment. presently no pumping NIL NIL N-A No discharge of water from mine.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Coal handling limited to storage only. Suppression arrangement provided. (B) NIL

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NCL- JAYANT PROJECT -OC, (M.P)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	NCL, JAYANT PROJECT (O.C)
2	Year of Commissioning	1976-77
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Senior Manager (Env. Engg.) NCL Ltd, Jayant Colliery ,Distt.- Singrauli (M.P) Pin-486890 Ph. NO.-07805-222228
4	Present status of mine whether active or closed	Active Open Cast Coal mine
5	Total coal reserve (in million tons)	116.28 MT
6	Present production rate (tones/day)	38000 TPD
7	Expected active life of mine (in year)	10 Years.
8	Characteristic of coal and its calorific value	C/D grade C.V.=3500-5400 Kcal/Kg.
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge	3250 KLD (Avg.)of three Season Yes mine water is being treated by ETP & its capacity is 32 MLD 01 No.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Water sprinkler at CHP. CHP Effluent is treated by ETP& dust suppression.

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NCL- JHINGURDAH PROJECT (M.P)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Jhingurdah project Singrauli (M.P),NCL
2	Year of Commissioning	1965
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sri Sona Ram At. PO- jhingurdah Project (NCL) Distt. Singrauli (M.P),Pin-486889, Mob. No. 09406711130
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	9.0 MT as on 31.3.2010
6	Present production rate (tones/day)	Avg.4000 TPD
7	Expected active life of mine (in year)	5 years
8	Characteristic of coal and its calorific value	Grade E CV=3360 to 4200 Kcal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge (E) Analysis report of waste water before and after treatment (to be enclosed)	25800 KLD Yes, ETP facility. 25,800 KLD 01 no. ETP All parameters in permissible range.
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Yes Effluent is being discharged to ETP for treatment.

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CAPTIVE- USHAA COAL MINE- RAIGARH (C.G.)

S.NO.	PARTICULARS	DETAILS
1	Name of the coal mine location details	Ushaa Coal Mine, Banjikhola, Tamnar, Raigarh (C.G.)
2	Year of Commissioning	13.04.2006
3	Name of official coordinating environmental related activity with address, email –ID and phone number	Sri A.K. Rai (DGM Coal Mine), anup.kumar@necoindia.com Mo. No.09302799985
4	Present status of mine whether active or closed	Active
5	Total coal reserve (in million tons)	14.316 MT
6	Present production rate (tones/day)	1485 MT/day
7	Expected active life of mine (in year)	33 years
8	Characteristic of coal and its calorific value	D/F grade ,CV=3325-5089 Kcal/Kg
9	Quantity of mine water discharge(KL/day) (A) Whether any treatment is given for mine discharge water, if yes give details. (B) Quantity of mine water reduced (C) number of mine discharge points (D) Name of water body receiving mine discharge (E) Analysis report of waste water before and after treatment (to be enclosed)	60.0 KLD Yes, the mine discharge water is primarily treated by the developing sump age .further treatment is settling tank. 01 no. Treatment plant then used in horticulture & sprinkling of road .
10	Details of Coal handling Yard (A) If pollution control facilities provided (B) Drainage and discharge	Sprinkling facility to avoid of air pollution