

4.2.3.9 Mining

1.0 Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the mines (based on underground mines, open cast mines, beneficiation plant/ others) District level.

Number of mines in the State. (Refer Annexure- Table-1).

Time trend of the number (growth) of Mines. (Refer Annexure- Table-2).

2.0 Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Mining sector

Water Supply & Demand for Mining sector in the State

Time trend of total water demand and actual current water supplied to the mining sector along with growth of mining sector in the state. (Refer Annexure- Table 2, 3)

Total Freshwater Withdrawal and Actual Water Consumption by Mining Sector in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Mining Sector in a State

Comparative status of total water consumption by each Mining site

State Water Budgeting: (Refer Annexure- Table 3(e)).

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
Mine 1				
Mine 2				
All Mines				
Others (viz. beneficiation plants)				
GRAND TOTAL	xxx	xxx	Xxx	xxx

3.0 Issues and Challenges

Illustrative issues and challenges may include matter like wastewater disposal, water demand and supply gap, surface and groundwater contamination, water pricing, etc.

4.0 Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0 Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Mining sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Mining sector in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Mining	Water allocation & Monitoring authority	Waste water discharge monitoring
<i>E.g. Ministry of Mining</i>	<i>E.g. CGWA/ Water resource department/ Urban or Rural body</i>	<i>e.g. State pollution Control Board</i>

Areas of Peoples/Private Participation if any

- Water Projects set up by Mining sector for the benefit of neighborhood/ local community/ Environment.

Mines	Any OE ¹⁷ or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Mines	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost (*Refer Annexure Table 6(a) & 6(b)*)
- Expenditure on Water management (*Refer Annexure Table 6(c) & 6(d)*)

6.0 Measurement, Monitoring and Data Constraints/ Management

Water & Wastewater Measurement:

Shall specify measurement methods and technologies at Raw water source, various processes and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- Data Management:** Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- Constraints** with respect to the measurement & monitoring.

7.0 Performance Indicators:

a. Benchmarks on water use (*Refer Annexure- table-13*)

b. Status of various Performance Indicators– for comparison across Districts/Mines

Category	Indicator		Bench Mark/ Unit (as applicable)	Mine 1	Mine 2	Mine 3
Measurement	Water Quantity					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
Real Time/ Automatic		Yes/No				
Undertaken internal Water Audit in the last Year?		Yes/No				

¹⁷Overexploited block of groundwater

	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			
Management Plans	Having Water Management Plans?		Yes/No			
	Whether Water Managements are operational		Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?		Yes/No			
	% of total Water requirement being met from Treated Waste Water					
	Have taken up Restoration measures?		Yes/No			
	% of reduction of water demand compared to the previous year.					
	Introduction of water efficient technologies in process to reduce water consumption.		Yes/No			
Water Use Efficiency (Annexure- Table7)	Specific Water Consumption (SWC); (m ³ /tonne) (refer Annexure-Table 7(a), (b) & (c))					
	Have specific water consumption within the norms/bench marks/standards		Yes/No			
Water Productivity (Annexure- Table 8)	Water Productivity (INR/m ³) Quantity of water necessary to produce these goods (refer Annexure- Table 8(a)&(b))					
Water Intensity (Annexure- Table 9)	Water Intensity; (m ³ /1000 Rs or m ³ /US\$) Volume of water used per unit of gross value added (GVA) (refer Annexure- Table 9(a)&(b))					
Water Foot print (Annexure- Table 10)	Total volume of freshwater used directly and/or indirectly for the industrial operation/product (refer Annexure- Table 10(a))					
Waste Water (Annexure- Table 11)	Total Waste Water Generated					
	% Waste Water Treated					
	% Treated waste water recycled					
	Implementation/ achieved zero liquid discharge (ZLD).		Yes/No			
Water Quality (Annexure-Table 12)	Installation of online water quality monitoring systems.		Yes/No			
	Compliance with the wastewater quality discharged norms.		Yes/No			
	Discharging wastewater into open area/ earthen nallah					

	/open drain/ municipal sewer?					
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).		Yes/No			
	No. of mining areas where Water Quality has adversely affected					
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?		Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?		Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?		Yes/No			
Public Interface	Operationalization of online water quality portal for information dissemination and feedback		Yes/No			

Category	Indicator	Bench Mark/ Unit (as applicable)	District 1	District 2	District 3
Water Quantity Measurement	% of Mines with water flow meters				
	% of water sources for mines geotagged				
	% of Mines undertaking internal water audits in last year				
	% of Mines undertaking external water audits in last year				
	% of Mines submitting water balance to SPCB (state pollution control board)				

8.0 Reforms undertaken/ being undertaken/ proposed if any**9.0 Road map of activities / tasks proposed for**

- Better governance
- Better source / supply management
- Better demand management /improved Water Use Efficiency
- Water Quality
- Water Economics and Financing
- Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1 Total number, types & capacity of Mines in the State

Total Production from Mines in the State			
Type of Mines	No of Mines	Total capacity (Planned) of Mines in Metric Tonne	Total Production in a year in Metric Tonne
Underground mines			
Opencast mines			
Others (viz. beneficiation plants)			
Total			

2 Growth Trend of Mines over a period and Water Demand and Supply position

Mines	Years					
	1990	1995	2000	2005	2010	2017
No. of Industries						
Underground mines						
Opencast mines						
Others (viz. beneficiation plants)						
Total						
Water Demand and Supply						
Total Water Demand (MCM)						
Total Water Supply (MCM)	<i>GW</i>					
	<i>SW</i>					
	<i>Municipal Supply</i>					
	<i>Total</i>					
Demand-Supply Gap						

3 Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Mining Industries: (MCM) Present Water Year: 1 st June to 31 st May next year									
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	TOTAL SUPPLY			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Mining Industries: (MCM)										
Source	Sub Source	Unit 1	Unit 2	Unit 3	Unit 4					TOTAL
Rain Water	Directly Harvested Rain Water									
Total										
Surface Water	Springs, Nallahs									
	Major Projects									
	Medium Projects									
	Minor Projects									
	Ponds, Tanks									
	Wetlands									
	Sea Water /Desalinated Water									
Inter Basin Transfer										
Total										
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)									
	Dug cum Bore well (Total No. x Draft)									
	Bore/Tube wells (Total No. x Draft)									
	Others etc									
Total										
Treated Waste Water										
GRAND TOTAL										

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks	
Rain Water (Directly Harvested)					
Springs, Nallahs					
Major Projects					
Medium Projects					
Minor Projects					
Ponds, Tanks					
Wetlands					
Desalinated Water/ Sea water					
Inter-Basin Transfer					
Ground Water (Dynamic)					
Treated Waste Water					
TOTAL (MCM)					

3(e) Summary State Water Budget for Mines

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Mines	xxx	Xxx	Xxx	xxx

4 Proportion of Water withdrawal and consumption by Mines against total industries in the State

Mines	Total Water Withdrawal by all Mines (%) (Refer Annexure-4(a))	Total water withdrawal by all the Industries in state	Total Water Consumption by all Mines (%) (Refer Annexure-4(b))	Total water Consumption by all the Industries in state
Underground mines				
Opencast mines				
Beneficiation plant				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by Mining sector in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Mining Sector (\%)} = \frac{(\text{Total water withdrawal by all the Mines in the State}) \times 100}{(\text{Total water withdrawal by all the industries in the state})}$$

4(b) Total Actual Water Consumption by Mining sector in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by Mining Sector (\%)} = \frac{(\text{Total actual water consumption by all Mines in State}) \times 100}{(\text{Total water consumption by all the industries in the state})}$$

4(c) Total Freshwater Withdrawal by all Mines and Total Actual Water Consumption by all Mines in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all Mines (MCM)												
Total Actual Water Consumption by all Mines (MCM)												

5 Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Mines (%) (Refer Annexure-5(a))						
Total Actual Water Consumption by all Mines (%) (Refer Annexure-5(b))						

5(a) Total Water Withdrawal/Abstraction by Mining sector in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Mining Sector (\%)} = \frac{(\text{Total water withdrawal by all the Mines in the State}) \times 100}{(\text{Total available freshwater resources of the state})}$$

5(b) Total Actual Water Consumption by Mining sector in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Mining Sector (\%)} = \frac{(\text{Total actual water consumption by all Mines in State}) \times 100}{(\text{Total available freshwater resources of the state})}$$

6 Water Economics & Financing:**6(a) Water Tariff (Rs./m³)**

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs.)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Mines on water treatment and management (Lakhs)						

Total O&M Expenditure by Mines on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by each Mine for the Current Year- CY

Mines	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
Mine 1				
Mine 2				
Mine 3				
Total				

7 Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Mining, it can be represented as the total volume of water used/consumed (m³) per tonne of mineral produced/beneficiated.

Specific Water Consumption (SWC) of Mines:

Specific Water Consumption (SWC); (m³/tonne)

$$= \frac{\text{Volume of water consumed by the Mines, (m}^3\text{)}}{\text{Total Production by the mine, (tonne)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed(m ³)	Total Mineral Production (tonne)	SWC (m ³ /tonne)
Mine 1			
Mine 2			
Mine 3			

7(b) Average SWC of Mines for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Mines in State						

7(c) Specific Water Consumption (SWC)

- Comparative Specific Water Consumption (SWC) of Mines
 - Trend of Specific Water Consumption (SWC) of each mine
- Percentage of mines having specific water consumption within the norms/bench marks/standards (if applicable).

8 Water productivity:

For e.g. (illustrative purpose only)

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\text{Water Productivity (INR/m}^3\text{)} = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), m}^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m³)

$$= \frac{(\text{Total Value of Mineral Production} - \text{Value of inputs other than water}), \text{INR}}{(\text{Total Volume of freshwater consumed}), \text{m}^3}$$

8(a) Water Productivity in terms of GVA for Current Year

	Value of Mineral Production	Value of inputs other than water	Total Volume of freshwater consumed	(Gross Value Added); (INR/m ³)
Mine 1				
Mine 2				
Mine 3				
Total				

8(b) Average Water Productivity in terms of GVA for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Productivity (GVA); (INR/m³)						

9 Water Intensity:

$$\text{Water Intensity; (m}^3\text{/1000 Rs or m}^3\text{/US\$)} = \frac{\text{Volume of water consumed by the Mines, (m}^3\text{)}}{(\text{Unit value added by mineral production}), (1000 \text{ Rs or US\$})}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Mineral production	Water Intensity; (m ³ /1000 Rs or m ³ /Rs)
Mine 1			
Mine 2			
Mine 3			
Total			

9(b) Average Water Intensity for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Intensity (m³/1000 Rs or m³/Rs)						

10 Water Footprint:

Water Footprint (WF) of per unit of mineral = Sum of WF of Operations of the unit and WF of Supply Chain

i.e. **Water Footprint (WF) = WF_{Supply Chain} + WF_{Operations}**

10(a) Water Foot print for Current Year

	WF _{Supply Chain}	WF _{Operations}	Total
Mine 1			
Mine 2			
Mine 3			
Total			

11Waste Water

	Bench Mark/ Units (as applicable)	Mine 1	Mine 2	Mine 3
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
Mine 1					
Mine 2					
Mine 3					

12Water Quality

		Bench Mark/regulatory norms (as applicable)	Mine 1	Mine 2	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for mining sector in state.**13(a) Benchmark for Water Consumption, Waste Water Generation etc.**

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m ³ /tonne		
2	Waste Water generation	m ³ /tonne		
3	Waste Water discharged	m ³ /tonne		