HYDROGEOLOGICAL STUDY REPORT

M/s. MSK JV MINING

BY

ATELA KALAN STONE MINE

(ML AREA: 54 HA)

AT

VILLAGE: ATELA KALAN, TEHSIL: CHARKHI DADRI

DISTRICT: CHARKHI DADRI FORMERLY BHIWANI (HARYANA)

JUNE 2025

ACKNOWLEDGEMENT

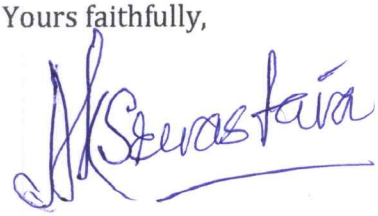
I am sincere thankful to the Management of M/s MSK JV By Atela Kalan Stone Mine (ML Area: 54 Ha) located at Village: Atela Kalan, Tehsil: Charkhi Dadri District: Charkhi Dadri formerly Bhiwani (Haryana) for entrusting the task of conducting Hydrogeological Study Report at the mine.

Thankful to the team of M/s MSK JV By Atela Kalan Stone Mine (ML Area: 54 Ha) for their keen interest in the Hydrogeological Survey and the whole hearted support and cooperation during the conduct of the field study, without which the study would not have steered to its successful completion.

During the Field Survey we certify that

- The report is based on the data collected at site during survey and information provided by the Company.
- The data collection has been carried out diligently and truthfully.
- All reasonable professional skill, care and diligence have been taken in preparing the report and the contents thereof are a true representation of the facts and figure.

Yours faithfully,



Dr. A. K. Srivastava

M.Sc. (G), Ph. D (Env. Mgmt. of Mines, MMEAI, MGAT, RQP(IBM)

QCI NABET Accredited Consultant, EIA (C)

QCI NABET Accredited Functional Area Expert, (Hydrogeology, HG)

T1/D1/9002, GH-7, Crossing Republic Society Township, Ghaziabad U.P.

NATIONAL ACCREDITATION BOARD FOR EDUCATION & TRAINING
QUALITY COUNCIL OF INDIA

Scheme for Accreditation of EIA Consultant Organizations

Accreditation Committee Meeting for Surveillance Assessment held on November 03, 2023 (VC mode)

The following members were present during the meeting:

1. Dr. G. K. Pandey - Chairman
2. Dr. J S Sharma - Member
3. Dr. Manoranjan Hota - Member
4. Prof. D. K. Sharma - Member
5. Dr. Gurdeep Singh - Member
6. Dr. Sarala Balachandran - Member

Dr. Ranjini Warrier and Dr. J S Sharma expressed their inability to attend the meeting

Sh. A K Jha- Sr. Director, Sh. Jagminder Kataria- Deputy Director, Ms. Samra Khan- Assistant Director and Ms. Chinmayi Salooja – Accreditation Officer from NABET-QCI were present at the meeting.

The following case was discussed and the decisions taken thereof are:

1.0 Case for Surveillance Assessment

The following cases were discussed and decisions were taken as noted below:

1.1 Techknowgreen Solutions Limited, Pune

The ACO has been assessed as per Version 3 of the Scheme, the assessment was conducted through Video Conference mode. The result of the Surveillance assessment (SA) is given below:

1.1.1 Category of Approval:

The ACO has scored more than 60% marks hence continues to be accredited with Cat. A

1.1.2 Scope of Accreditation:

Sl. No.	NABET Scheme Sectors	Name of Sector	Cat.	Project or Activity as per MoEFCC Notification dt. September 14,2006 & subsequent Amendments

1.	1	Mining of minerals - Open cast only	B	1 (a) (i)
2.	3	River Valley Projects	A	1 (c)
3.	4	Thermal power plants	A	1 (d)
4.	8	Metallurgical industries (ferrous & nonferrous) – both primary and secondary	B	3 (a)
5.	9	Cement Plants	A	3 (b)
6.	21	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	B	5 (f)
7.	22	Distilleries	A	5 (g)
8.	25	Sugar Industry	B	5 (j)
9.	32	Common hazardous waste treatment, storage and disposal facilities (TSDFs)	B	7 (d)
10.	34	Highways	A	7 (f)
11.	36	Common Effluent Treatment Plants (CETPs)	B	7 (h)
12.	38	Building and construction projects	B	8 (a)
13.	39	Townships and Area development projects	B	8 (b)

1.1.3 Sectors approved for EIA Coordinators (ECs):

a. Assessed as per SA norms – for ECs approved earlier:

Sl. No.	Name	Earlier approval status (in IA /subsequently)		Approval status (after SA)		Remarks
		Sectors approved	Cat.	Sectors approved	Cat.	
In-House						
1	**Rutuja Dilip Bhasme**	38	B	38	B	None
Empaneled						
2	**Adhikrao Govind Yewale**	21	B	21	B	With an observation
		22	A	22	A	With an observation

b. Assessed as per IA norms – for new Sectors of approved ECs and fresh ECs proposed:

Sl. No.	Name	Sectors			Cat.	Remarks
		Applied	Recommended	Approved		
In-house						
1	**Ajay Ramakant Ojha**	4	Yes	Yes	A	None
		21	Yes	Yes	B	
		36	Yes	Yes	B	
		39	Yes	Yes	B	
2	**Arin Bandyopadhyay**	1	Yes	Yes	B	Opencast
		32	Yes	Yes	B	None

Sl. No.	Name	Sectors			Cat.	Remarks
		Applied	Recommended	Approved		
		38	Yes	Yes	B	
		39	Yes	Yes	B	
3	**Mohammad Nadeem Yousuf Shaikh**	38	Yes	Yes	B	None
4	**Surekha Balasaheb Ugale**	22	Yes	Yes	B	None
		25	Yes	Yes	B	
Empaneled						
5	**Adhikrao Govind Yewale**	3	Yes	Yes	A	Irrigation only With an observation
		4	Yes	Yes	B	With an observation
		36	Yes	Yes	B	
6	**Anjali Ajay Singam**	8	Yes	Yes	B	With an observation .
		9	Yes	Yes	A	
		34	Yes	Yes	A	

1.1.4 Functional Areas (FA) approved for Functional Area Experts (FAEs)

a. Assessed as per SA norms – for FAEs approved earlier:

Sl. No.	Name	Earlier approval status (in IA /subsequently)		Approval status (after SA)		Remarks
		FAs approved	Cat.	FAs approved	Cat.	
In-house						
1	**Rutuja Dilip Bhasme**	WP	B	CA	B	None
2	**Mohammad Nadeem Yousuf Shaikh**	WP	B	CA	B	None
3	**Ajay Ramakant Ojha**	AP	A	CA	A	None
		AQ	A	CA	A	
		WP	A	CA	A	
Empaneled						
4	**Hemanshu Prakashbhai Pathak**	LU	A	CA	A	With an observation
5	**Kedar Suresh Champhekar**	EB	A	CA	A	With an observation
6	**Chintan Athalye**	NV	A	CA	A	With an observation
7	**Ashish Dongre**	Geo	B	CA	B	With an observation
		HG	B	CA	B	
8	**Rahul Laxman Patil**	RH	B	CA	B	With an observation
9	**Adhikrao Govind Yewale**	AP	B	CA	B	With an observation
		AQ	B	CA	B	
		WP	B	CA	B	

b. Assessed as per IA norms – approved experts for new functional areas and fresh FAEs proposed:

Sl. No.	Name	Functional Area			Cat.	Remarks
		Applied	Recommended	Approved		
In-house						
1	**Prasad Rangrao Pawar**	SHW	Yes	Yes	B	None
2	**Ajay Ramakant Ojha**	SHW	Yes	Yes	A	None
3	**Surekha Balasaheb Ugale**	WP	Yes	Yes	B	None
4	**Nitesh Jadhav**	SE	Yes	Yes	B	None
5	**Arin Bandyopadhyay**	Geo	Yes	Yes	A	None
		HG	Yes	Yes	A	
6	**Rafat Quamar**	Geo	Yes	Yes	B	None
		HG	Yes	Yes	B	
Empaneled						
7	**Anjali Ajay Singam**	AQ	Yes	Yes	A	With an observation
8	**Prachi Sameer Sathe**	LU	Yes	Yes	A	With an observation
9	**Sagar Madhavrao Karande**	RH	Yes	Yes	B	With an observation
10	**Manoj Kumar**	SC	Yes	Yes	B	With an observation
11	**Satyavrat Pandey**	SE	Yes	Yes	A	With an observation

1.1.5 Functional Area Associates (FAAs):

a. FAAs proposed:

Sl. No.	Name	Approval status (after SA)		FAE/Mentor	Remarks
		Applied	Approved		
In-house					
1	**Pratiksha Mohanrao Parjane**	NV	Yes	**Chintan Athalye**	None
		LU	Yes	**Hemanshu Prakashbhai Pathak**	
2	**Megha Tukaram Patil**	SHW	Yes	**Prasad Rangrao Pawar**	None
3	**Ankita Hari Gurav**	SHW	Yes	**Prasad Rangrao Pawar**	None

Note: The following will be communicated to the ACO by NABET-

- Detailed observations and reasons for alerts (if any)
- Results of balance candidates and details of the assessment.

2.1 Grass Roots Research & Creation India (P) Ltd., Noida

The ACO has been assessed as per Version 3 of the Scheme. The assessment was conducted through VC. The result of the Surveillance assessment (SA4) is given below:

2.1.1 Category of Approval:

The ACO has scored more than 60% marks hence continues to be accredited with Cat. A

2.1.2 Scope of Accreditation:

S.No	NABET Scheme Sectors	Sector Description	Cat.	Sector No.(MoEFCC Notification dated Sep. 14, 2006 and Amendments)
1.	1	Mining of minerals including Open cast/ Underground mining	A	1 (a) (i)
2.	4	Thermal power plants	A	1 (d)
3.	6	Coal Washeries	A	2 (a)
4.	7	Mineral beneficiation including pelletisation	A	2 (b)
5.	8	Metallurgical industries (ferrous & non ferrous)	A	3 (a)
6.	9	Cement Plants	A	3(b)
7.	11	Coke oven plants	A	4(b)
8.	12	Asbestos milling and asbestos based products	A	4 (c)
9.	21	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	A	5 (f)
10.	22	Distilleries	A	5 (g)
11.	31	Industrial estates/ parks/ complexes/ Areas, export processing zones (EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	A	7 (c)
12.	32A	Bio-medical waste treatment facilities	B	7 (da)
13.	33	Ports, harbours, break waters and dredging	A	7 (e)
14.	36	Common effluent treatment plants (CETPs)	B	7 (h)
15.	37	Common Municipal Solid Waste Management Facility (CMSWMF)	B	7 (i)
16.	38	Building and construction projects	B	8 (a)
17.	39	Townships and Area Development projects	B	8 (b)

2.1.3 Sectors approved for EIA Coordinators (ECs):

a. Assessed as per SA norms – for ECs approved earlier:

Sl. No.	Name	Earlier approval status (in RA3 /subsequently)		Approval status (after SA)		Remarks
		Sectors approved	Cat.	Sectors approved	Cat.	
In-house						

Sl. No.	Name	Earlier approval status (in RA3 /subsequently)		Approval status (after SA)		Remarks
		Sectors approved	Cat.	Sectors approved	Cat.	
1	**Brahma Nand Chaudhari**	38	B	-	-	Left the organization
2	**Monika Gupta**	1	B	CA	B	Opencast only
3	**Saurabh Gola**	38	B	CA	B	None
		39	B	CA	B	
4	**Kalidas Choudhury**	9	A	CA	A	None
5	**Kamal Lochan Satapathy**	1	A	CA	A	None
6	**Sonu**	22	B	CA	A	Upgraded
		38	B	CA	B	None
7	**Dhiraj Kumar Singh**	1	A	CA	A	None
		38	B	CA	B	
8	**Mudita Tomar Singh**	1	B	CA	B	Opencast only
		31	B	CA	B	None
		39	B	CA	B	
Empaneled						
9	**Tapan Majumder**	1	A	CA	A	None
10	**Jayant Kumar Moitra**	1	A	-	-	Left the organization
		4	A	-	-	
		6	A	-	-	
		8	A	-	-	
		9	A	-	-	
11	**Kailash Nath Sharma**	22	A	CA	A	None
		38	B	CA	B	With an alert.
12	**Ashok Kumar Rathoure**	1	A	CA	A	Opencast only.
		9	A	CA	A	None
		21	A	CA	A	
13	**Arun Kumar Jaggi**	32A	B	CA	B	None
14	**Sanagapati Chandrasekhar Babu**	1	A	-	-	Left the organization
		7	A	-	-	
		8	A	-	-	

b. Assessed as per IA norms – for new Sectors of approved ECs and fresh ECs proposed:

Sl. No.	Name	Sectors			Cat.	Remarks
		Applied	Recommended	Approved		
In-house						
1	**Monika Gupta**	38	Yes	Yes	B	None
		39	Yes	Yes	B	
2	**Ankit Rana**	1	Yes	Yes	B	Opencast only
		8	Yes	Yes	B	Ferrous only
		38	Yes	Yes	B	None
		39	Yes	Yes	B	
3	**Saurabh Gola**	1	Yes	Yes	B	Opencast only
4	**Kalidas Choudhury**	1	Yes	Yes	A	None

Sl. No.	Name	Sectors			Cat.	Remarks
		Applied	Recommended	Approved		
		4	Yes	Yes	A	
		8	Yes	Yes	A	
		31	Yes	Yes	A	
5	**Kamal Lochan Satapathy**	4	Yes	Yes	B	None
		9	Yes	Yes	A	
		12	Yes	Yes	A	
		38	Yes	Yes	B	
6	**Sonu**	6	Yes	Yes	B	None
		8	Yes	Yes	B	Ferrous only; With observation.
		39	Yes	Yes	B	None
7	**Dhiraj Kumar Singh**	6	Yes	Yes	A	None
		31	Yes	Yes	A	
		39	Yes	Yes	B	
8	**Kashi Nath Dutta**	38	Yes	Yes	B	None
9	**Mudita Tomar Singh**	22	Yes	Yes	B	None
		37	Yes	Yes	B	
10	**Kavita Chopra**	38	Yes	Yes	B	None
11	**Rajiv Rastogi**	1	Yes	Yes	A	With observation
		7	Yes	Yes	A	None
		12	Yes	Yes	A	
Empaneled						
12	**Shashi Shekhar**	1	Yes	Yes	A	With observation
		6	Yes	Yes	A	None
13	**Naraina Varde**	33	Yes	Yes	A	None
		38	Yes	Yes	B	
		39	Yes	Yes	B	
14	**Shiv Kumar Singh**	1	Yes	Yes	B	None
		4	Yes	Yes	B	With observation
		7	Yes	Yes	B	With observation
		9	Yes	Yes	B	With observation
15	**Kailash Nath Sharma**	4	Yes	Yes	B	With observation
		8	Yes	Yes	B	
		21	Yes	Yes	B	
16	**Ashok Kumar Rathoure**	8	Yes	Yes	A	Ferrous Only
17	**Arun Kumar Jaggi**	36	Yes	Yes	B	None
18	**Ashok Kumar Srivastava**	1	Yes	Yes	A	None
		7	Yes	Yes	A	
19	**Vikas Kumar**	8	Yes	Yes	A	Ferrous only
		11	Yes	Yes	A	None

2.1.4 Functional Areas (FA) approved for Functional Area Experts (FAEs)

a. Assessed as per SA norms – for FAEs approved earlier:

Sl. No.	Name	Earlier approval status (in RA3 /subsequently)		Approval status (after SA)		Remarks
		FAs approved	Cat.	FAs approved	Cat.	
In-house						
1	**Brahma Nand Chaudhari**	LU	B	-	-	Left the organization
		SE	A	-	-	
2	**Monika Gupta**	AP	B	CA	B	None
		WP	B	CA	B	
3	**Saurabh Gola**	WP	B	CA	B	None
4	**Kalidas Choudhury**	AP	A	CA	A	None
		NV	A	CA	A	
		RH	A	CA	A	
5	**Kamal Lochan Satapathy**	AQ	A	CA	A	None
6	**Sonu**	WP	B	CA	A	Upgraded
7	**Shyamala Krishna Mani**	BMW	A	CWA	A	With an alert
		SW	A	CA	A	None
8	**Dhiraj Kumar Singh**	AP	A	CA	A	None
		SHW	A	CA	A	
		WP	A	CA	A	
9	**Mudita Tomar Singh**	AQ	B	CA	A	Upgraded
		WP	B	CA	B	None
Empaneled						
10	**Tapan Majumder**	HG	A	CA	A	None
		GEO	A	CA	A	
11	**Jayant Kumar Moitra**	AP	A	-	-	Left the organization
		AQ	A	-	-	
		RH	A	-	-	
		SHW	A	-	-	
12	**Swapan Kumar Bandopadhyay**	RH	A	CA	A	None
13	**Neha Singh**	AP	B	-	-	Left the organization
		AQ	B	-	-	
		NV	B	-	-	
		WP	B	-	-	
14	**Kailash Nath Sharma**	AP	A	CA	A	None
		WP	A	CA	A	
15	**Ashok Kumar Rathoure**	WP	B	CA	A	Upgraded.
		EB	A	CA	A	
16	**Sanagapati Chandrasekhar Babu**	AP	A	-	-	Left the organization
		NV	A	-	-	
		RH	A	-	-	
17	**Vikas Kumar**	AQ	A	CA	A	None
		N	A	CA	A	

b. Assessed as per IA norms – approved experts for new functional areas and fresh FAEs proposed:

Sl. No.	Name	Functional Area			Cat.	Remarks
		Applied	Recommended	Approved		
In-house						
1	**Monika Gupta**	AQ	Yes	Yes	B	None
2	**Ankit Rana**	AP	Yes	Yes	B	None
3	**Kamal Lochan Satapathy**	NV	Yes	Yes	A	With observation
4	**Sonu**	AP	Yes	Yes	B	None
		AQ	Yes	Yes	B	
5	**Dhiraj Kumar Singh**	EB	Yes	Yes	A	None
6	**Kashi Nath Dutta**	SE	Yes	Yes	A	None
7	**Payal Yadav**	SW	-	-	-	Left the organization
		AQ	-	-	-	
		AP	-	-	-	
8	**Shadab Nasim**	AP	-	-	-	Left the organization
		AQ	-	-	-	
9	**Rajiv Rastogi**	SE	Yes	Yes	A	None
10	**Kavita Chopra**	EB	Yes	Yes	B	None
Empaneled						
11	**Shashi Shekhar**	SW	Yes	Yes	B	None
12	**Naraina Varde**	LU	Yes	Yes	A	None
		SC	Yes	Yes	A	
13	**Kailash Nath Sharma**	RH	Yes	Yes	A	With observation
		SHW	Yes	Yes	A	HW only
14	**Ashok Kumar Srivastava**	GEO	Yes	Yes	A	None
		HG	Yes	Yes	A	
		SC	Yes	Yes	A	

2.1.5 Functional Area Associates (FAAs):

a. FAAs proposed:

Sl. No.	Name	Approval status (after SA)		FAE/Mentor	Remarks
		Applied	Approved		
In-house					
1	**Saransh Gupta**	SHW	-	-	Left the organization
		RH	-	-	
2	**Aanchal Sharma**	AP	Yes	Dhiraj Kr Singh	None
		EB	Yes	Ashok Kumar Rathoure	
3	**Devyani Swain**	AP	Yes	Dhiraj Kr Singh	None
		EB	Yes	Ashok Kumar Rathoure	
4	**Ashay Amardas Jambhulkar**	AP	Yes	Dhiraj Kr Singh	None
		EB	Yes	Ashok Kumar Rathoure	
5	**Nikhil Kumar**	SHW	Yes	Dhiraj Kr Singh	None
		WP	Yes	Kailash Nath Sharma	
6		SHW	Yes	Dhiraj Kr Singh	None

Sl. No.	Name	Approval status (after SA)		FAE/Mentor	Remarks
		Applied	Approved		
	Monali Kumari	EB	Yes	Ashok Kumar Rathoure	

Note: The following will be communicated to the ACO by NABET-

- Detailed observations and reasons for alerts (if any)
- Results of balance candidates and details of the assessment.

The meeting ended with a vote of thanks to the Chair.

Issued by

(A K Jha)
Senior Director
QCI-NABET

Abbreviations:

AO	-	Applicant Organization
ACO	-	Accredited Consultant Organization
AC	-	Accreditation Committee
RA	-	Re-Accreditation
SA	-	Surveillance Assessment
EC	-	EIA Coordinator
FA	-	Functional Area
CA	-	Continue by Assessment
FAE	-	Functional Area Expert
FAA	-	Functional Area Associate
For sector numbers-		Refer the Scheme
For functional areas-		Refer the Scheme
NC	-	Non Conformance

HYDROGEOLOGICAL STUDY REPORT

M/s. MSK JV BY ATELA KALAN STONE MINE (ML AREA: 54 HA) LOCATED AT VILLAGE: ATELA KALAN, TEHSIL: CHARKHI DADRI, DISTRICT: CHARKHI DADRI FORMERLY BHIWANI (HARYANA)

CHAPTER 1

1 INTRODUCTION

M/s MSK JV MINING has taken up Atela Stone Mines in Atela Kalan with capacity expansion of mining of Stone along with associated minor minerals from 60,00,000 TPA to 85,00,000 TPA over an area 54.00 ha at village Atela Kalan, Tehsil and district Charkhi Dadri and state Haryana. The mine (54 ha) is an open cast fully mechanized mine of stone granted in favour to M/s. MSK (JV) by bidding process and a mining plan was approved vide letter no. DMG/HY/Atela Kalan/MP/4154 dated 15.09.2014. The lease deed was executed on 13.01.2015.

1.1 NEED FOR THE STUDY

The present Hydrogeological study of the mine depicts the ground water condition of villages falling within the study area covering 5 km radius from the Mine boundary (as per MOEF&CC Guidelines).

The company has approached STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY HARYANA (SEIAA) for grant of Environmental Clearance (EC). The EC was granted by SEIAA, Haryana vide its EC Identification no. EC24B001HR177025 and File No. SEIAA/HR/2022/163 dated 06.06.2024. In order to comply with the specific as well as general conditions of the EC, the additional Hydro geological study has been conducted for the existing project.

The basic data such as the villages falling within the study area and the land use, irrigation water requirement, domestic water requirement, rainfall and aquifer parameters of the study area have been considered for the study.

Hydrological and Hydrogeological Studies include assessment of ground water potential, identifying and suggesting recharge measures to augment the ground water sources as per the MoEF&CC Guidelines. The study is also focused on the Ground water level in and around the mine lease area and to study the impact of mining on the ground water regime.

1.2 SCOPE OF STUDY

The scope of work includes the following:

1. To analyze physiographic conditions of the study area with the help of field observations, GPS readings, Survey of India (SOI) Toposheet and Satellite images.
2. To observe hydro geological conditions and study of aquifer system of the area i.e. in Core and 5 km Buffer Zone.
3. To work out quantitative as well as qualitative variations in groundwater with respect to aerial extent and to find out water balance.
4. To observe surface water features and their impact on groundwater balance.
5. To ascertain the impact of mine on groundwater conditions of the surrounding area.
6. To work out scope of Rainwater harvesting within the mine and design suitable recharge system to the extent possible within the lease area.
7. To suggest ways and means of creating artificial recharge to negate adverse impact on groundwater regime and their impact on groundwater regime of the area if any.
8. To prepare detailed Hydro-geological Report and Rainwater Harvesting Plan.

1.3 METHODOLOGY

Following methodology has been adopted to conduct hydro-geological investigation in the area:

1. Physiographic studies of the mine and its surroundings with the help of latest Google images, site visit, GPS survey etc. which helps in determining physiographic gradient.
2. Secondary data collection i.e. climate and rainfall, soil and topography, geology, drainage etc. for interpretation.
3. Detailed hydro-geological survey in core and buffer zone including geology, types of aquifer and their hydraulic parameters governing the groundwater regime of the area, depth to water level, groundwater quality, water abstraction structures and their discharge, surface water bodies, drainage pattern, major irrigation sources and their potential etc.

4. Groundwater resources evaluation based on the norms recommended by Groundwater Estimation Committee (GEC), 2020.
5. Evaluation of present groundwater scenario as well as future course of action for protecting the natural environment
6. Scope of Rainwater Harvesting from runoff generated from different sections of mine depending upon average annual rainfall and its intensity, recharge capacity of the aquifers & the design considerations.

1.4 LOCATION AND EXTENT OF THE STUDY AREA

The location map of the study area is given in figure 1.1. The corner coordinates of the project site are marked in the google earth map and same has been given in figure 1.2. The Salient feature of the project is given in the **Table 1.1**

Table 1.1
Salient Features of the Project

S. No.	Particulars	Information		
1	Name of Project with Address	**M/s. MSK JV By Atela Kalan Stone Mine (ML Area: 54 Ha) located at Village: Atela Kalan, Tehsil: Charkhi Dadri District: Charkhi Dadri formerly Bhiwani (Haryana)**		
2	State	**Haryana**		
3	District	**Charkhi Dadri formerly Bhiwani**		
4	Block/ Taluka	**Charkhi Dadri**		
5	Category of Block/ Taluka (as per prevailing GWRE)	**Safe as per HWRA 2022 (https://hwra.org.in/Guidelines.html)**		
6	Toposheet (OSM) No.	**H43W2**		
7	Latitude and Longitude of Atela Kalan Stone Mine	**Pillars**	**Latitude**	**Longitude**
		A	**28⁰ 34'39.02"**	**76⁰ 05'38.24"**
		B	**28⁰34'41.00"**	**76⁰05'52.20"**
		C	**28⁰34'41.20"**	**76⁰06'05.30"**
		D	**28⁰ 34'41.90"**	**76⁰06'05.90"**
		E	**28⁰ 34'42.11"**	**76⁰06'08.13"**
		F	**28⁰ 34'40.19"**	**76⁰06'07.10"**
		G	**28⁰ 34'37.08"**	**76⁰06'04.28"**
		H	**28⁰34'36.81"**	**76⁰06'04.48"**
		I	**28⁰34'40.19"**	**76⁰06'08.13"**
		J	**28⁰ 34'24.53"**	**76⁰06'13.90"**
		K	**28⁰ 34'10.94"**	**76⁰ 05'59.22"**
		L	**28⁰ 34'23.37"**	**76⁰05'45.60"**
8	Nearest Town	**Charkhi Dadri – 6.5 Km, SE**		

9	Nearest major city with 200000 population	**Bhiwani – 14.5 Km, N**
10	Nearest Railway Station	**Manheru Railway station – 7.0 Km, NE**
11	Nearest Airport	**Indira Gandhi International Airport, Delhi – 95 Km, E**
12	Seismic Zone	**Zone III**

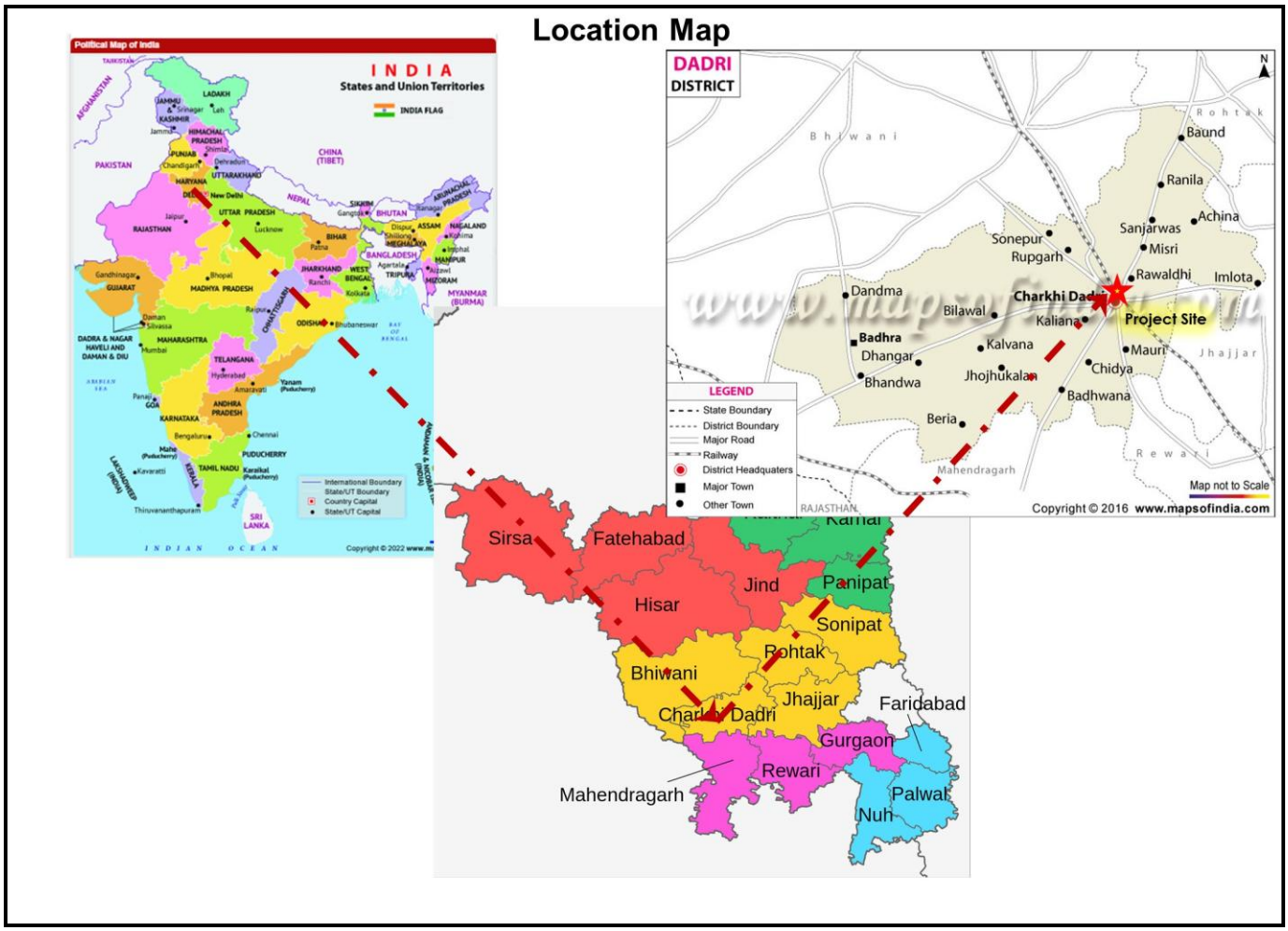


Figure 1.1: Map showing location map of the study area of Atela Kalan Stone Mine (ML Area: 54 Ha)

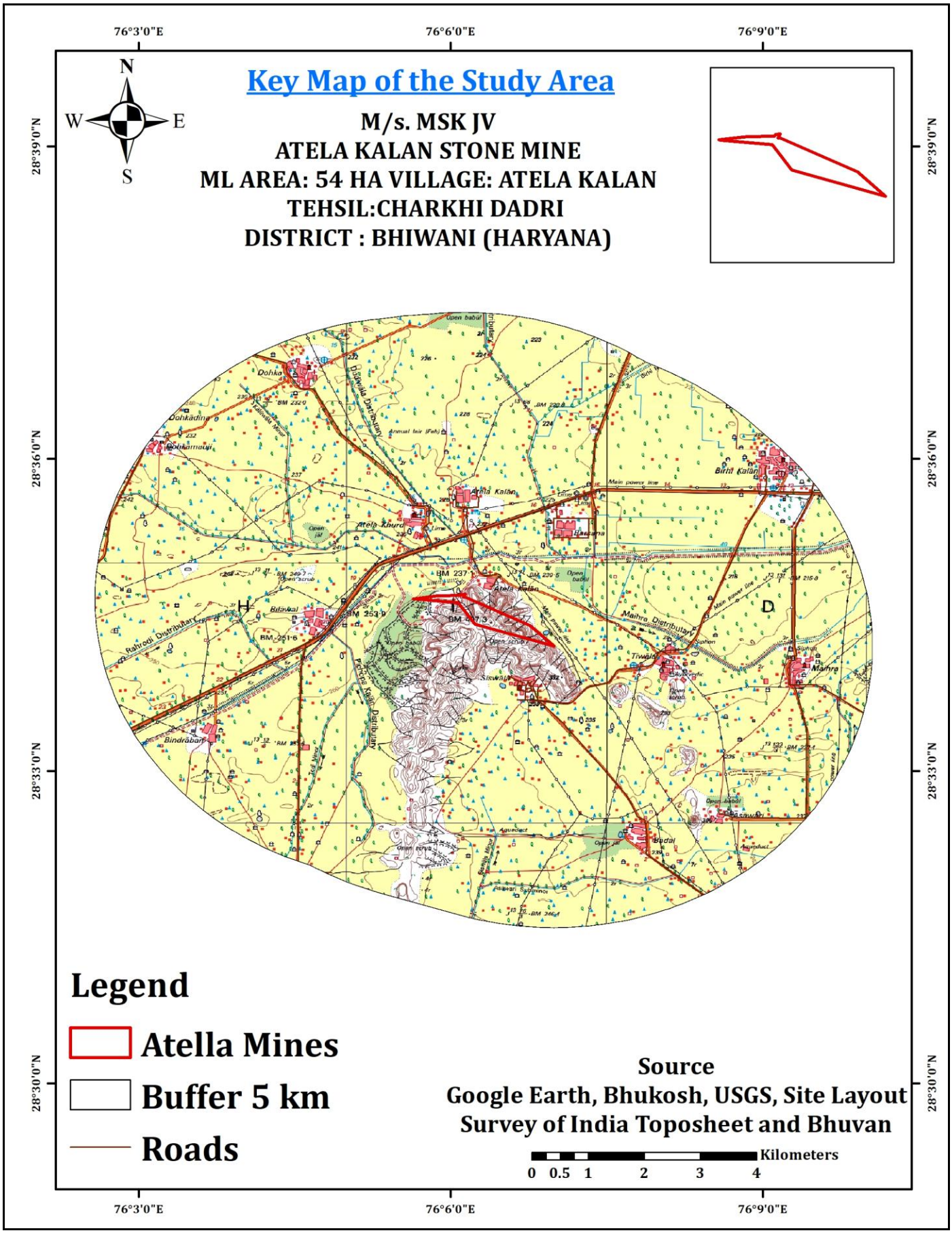


Figure 1.2: Map showing Key Plan of 5km study area of Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: Toposheet of India)

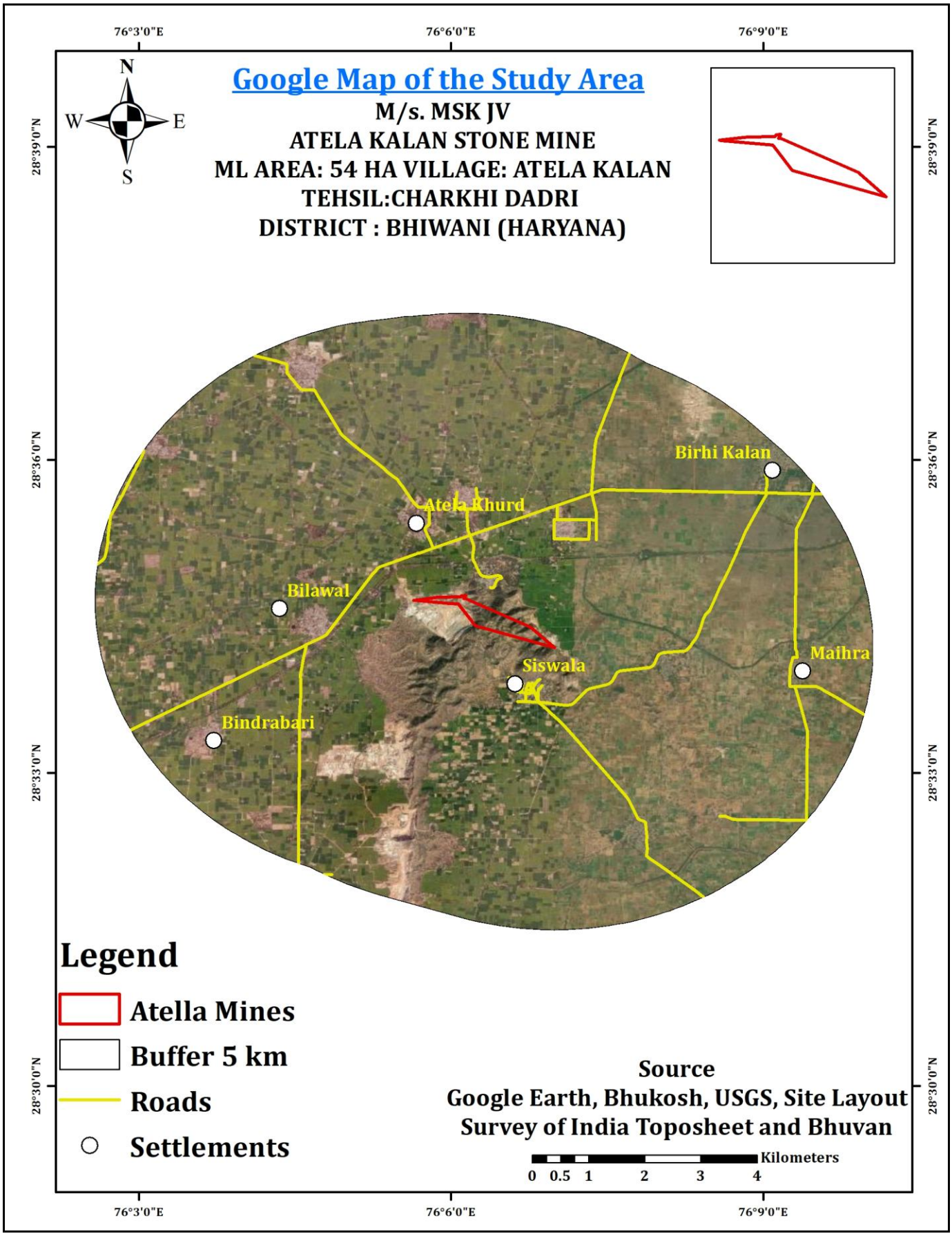


Figure 1.3: Map showing Google Imagery of 5km study area of Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: Google Earth)

1.5 PHYSIOGRAPHY

The topography values range between 170 to 400 m amsl and has been plotted to prepare the elevation contour map. The area consists of flat and level plain interrupted from place to place by clusters of sand dunes, isolated hillocks and rocky ridges. A few isolated rocky ridges elevated sharply from the plain occur in the south central portion or the district. Dohan River is the only ephemeral stream in the area and flows in direct response to precipitation. Only the tail of this ephemeral stream falls in the south-central corner of the district and ultimately dies out in sands around village.

The type of soil is an important factor for the growth of plants and crops in any area. The district has two types of soils viz Sierozem and Desert soils. The sierozem soils are found in major parts of the district and desert soils are comparatively found in smaller part of the district especially in southern part of the district. Sierozem Soil are found in the areas where the normal annual rainfall varies from 300 to 500 mm. These soils vary from sandy loam to loamy sands in texture and are marginally fertile. Degree of salinity and alkali hazards is highly variable, though salinity is major hazard. These soils occur mainly in northern parts of the district

The ML area is a highly undulated area with rugged topography. The highest point in the lease area is recorded to be 400 mRL and the surface level at 239 mRL, hence height of lease area is 162 m above ground. The Contour Elevation map of the core and buffer zone is shown in ***Figure 1.4***

Physiography and Elevation of the Mine

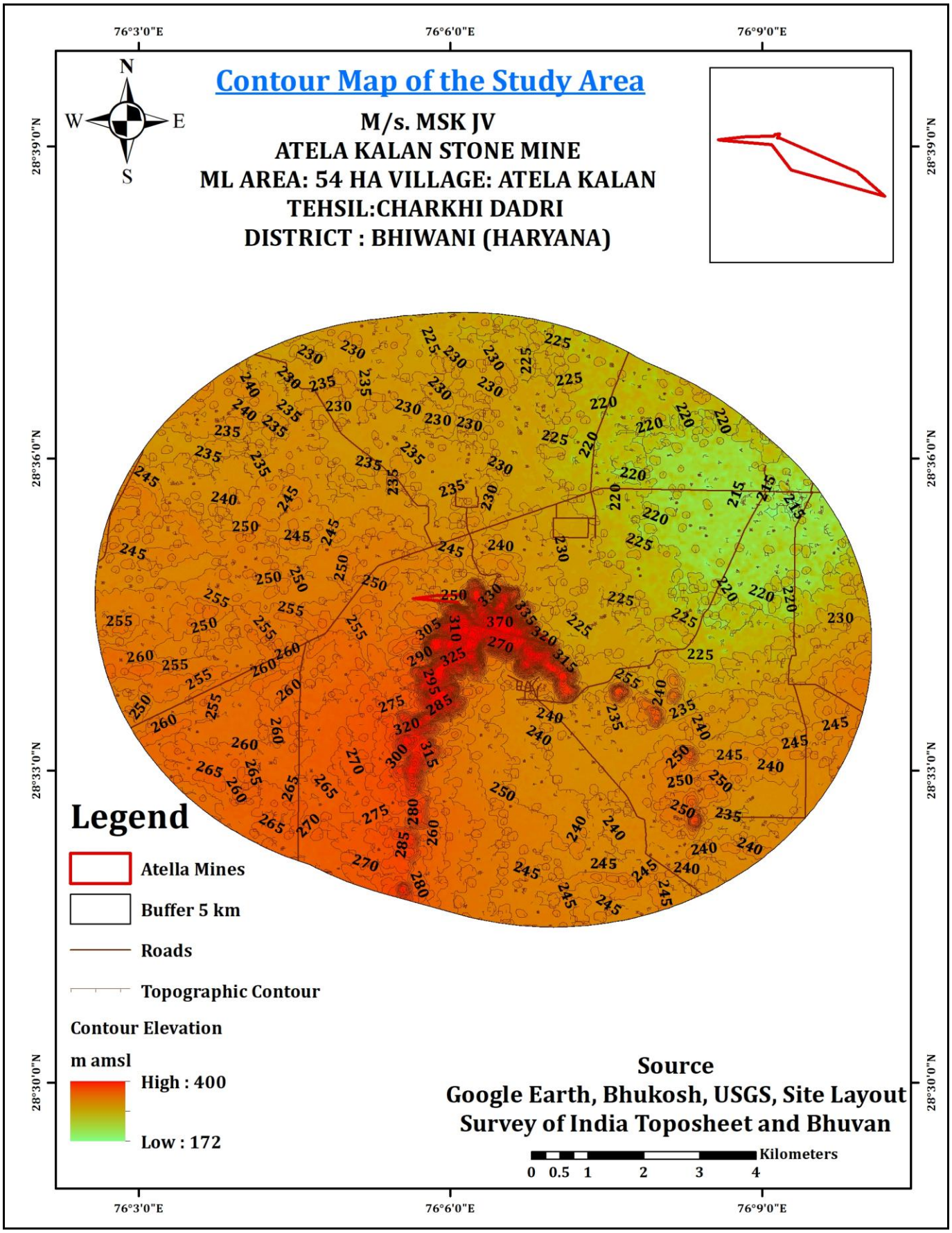


Figure 1.4: Map showing Contour Elevation of 5km study area of DEM of Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: USGS)

1.6 DRAINAGE AND WATER BODIES

There is no perennial river passing through the district. Physiographically the district consists of flat and level plain from place to place by clusters of sand dunes, isolated hillocks and rocky ridges. A few isolated rocky ridges elevated sharply from the plain occur in the south-central portion of the district. The lease area is consists of Hilly terrain. The lease area does not have any water body. There are dry Nallahs in which water flows during rains for a short duration, otherwise they remain dry for the rest of the months. The rainwater from these Nallahs drain either into local Johars or in agricultural fields. Highest level in the lease area is 330 m amsl and ground level/surface level is 225 m amsl.

Mining lease has been granted in plots due to the Village, roads, nalas and habitation. Appropriate safety barrier will be left. The local drainage pattern in and around the area is sub-parallel and dendritic in nature with low drainage density indicating the formation in the area is comparatively porous and permeable in nature. **(Figure 1.5)**

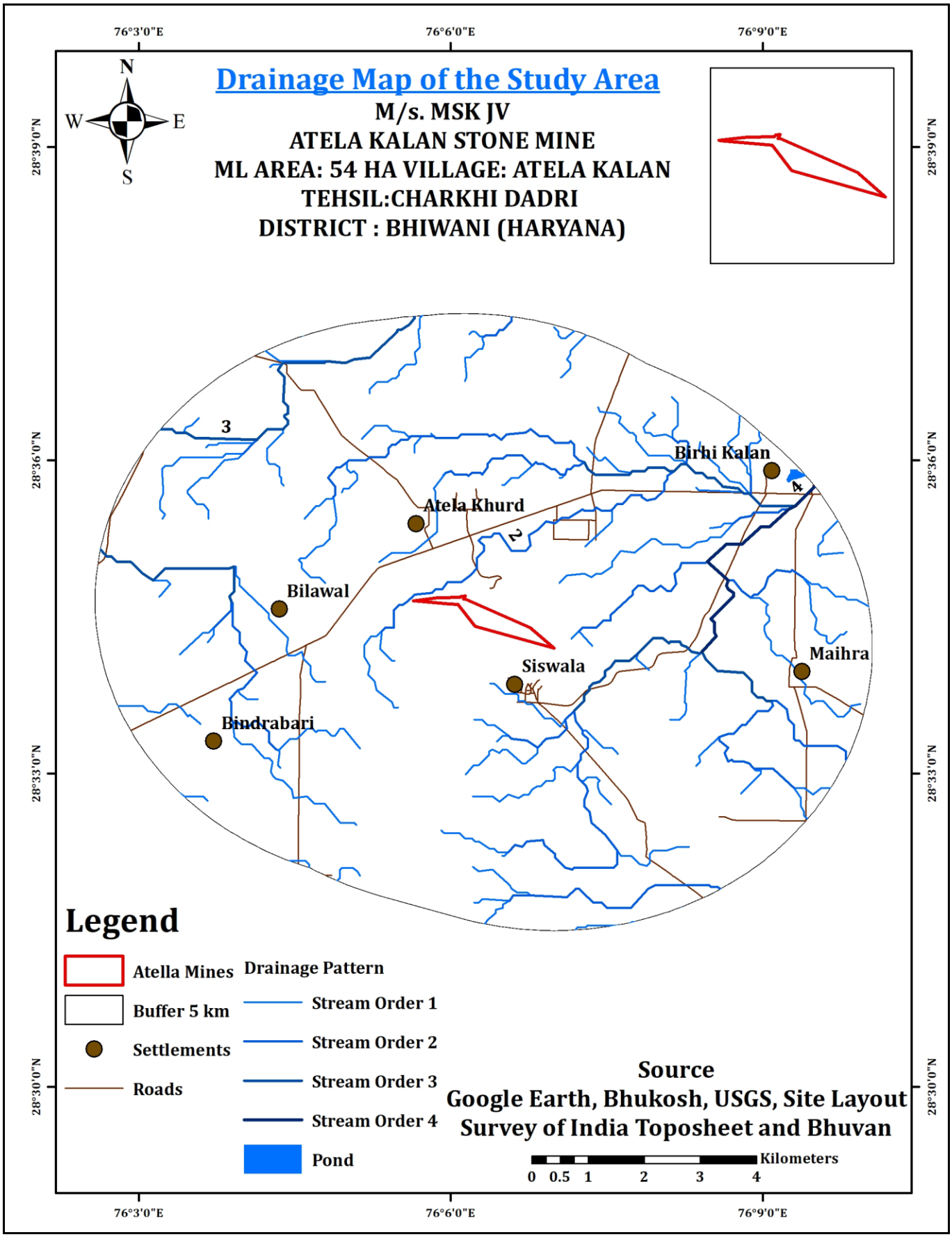


Figure 1.5: Map showing Drainage Pattern of 5km study area of Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: USGS)

1.7 CLIMATE AND RAINFALL

The climate of Charkhi Dadri formerly Bhiwani district can be classified as tropical steppe, semi-arid and hot which is mainly dry with very hot summer and cold winter except during monsoon season when moist air of oceanic origin penetrate into the district. There are four seasons in a year. The hot weather season starts from mid-March to last week of the June followed by the south-west monsoon which lasts up to September. The transition period from September to October forms the post-monsoon season. The winter season starts late in November and remains up to first week of March. The normal annual rainfall of the district is 420 mm which is unevenly distributed over the area 22 days. The southwest monsoon sets in from last week of June and withdraws in end of September contributed about 85% of annual rainfall. July and August are the wettest months. Rest 15% rainfall is received during non-monsoon period in the wake of western disturbances and thunderstorms. Generally, rainfall in the district increases from southwest to northeast.

The annual average rainfall in the region is around 420 mm (average of last ten years rainfall data from 2015-2024) varying from minimum 320 mm in 2022 to maximum 700 mm in 2024.

Table 1.2:
Rainfall Details of the Area

S. No	Year	Rainfall (mm)
1	2015	460
2	2016	460
3	2017	330
4	2018	400
5	2019	450
6	2020	350
7	2021	400
8	2022	320
9	2023	330
10	2024	700
Average		420

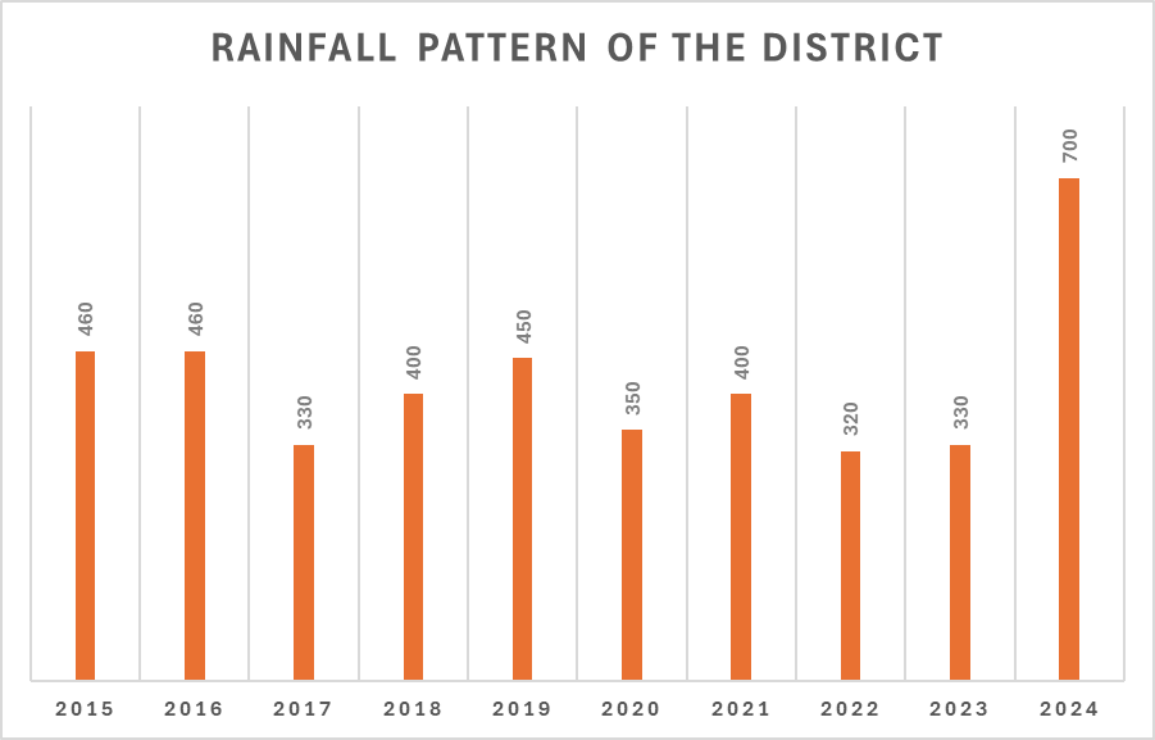


Figure 1.6: Rainfall Graph of the Study Area

1.8 LAND USE PATTERN

The land use in the village reflects the socio-economic conditions of the people in addition to the natural environmental factors. The land use is also one of the prime parameters to be considered for the ground water estimation. There is no forest in and around 5 km of the mine site. The second major land use is land with or without scrub. The crop land occupies less area in the plains. Rain fed agriculture is observed in the area. During the site visit, it has been observed that most of the area is not irrigated and left as fallow land. Very less area is irrigated by ground water as the ground water availability is poor. River or tank-based irrigation systems have not been observed in the area.

1.8.1 LAND USE OF MINES AREA

Table 1.3:
Land Use Details of the Mine

S. No	Details	Existing Land Use (ha)	At the Conceptual Stage (ha)
1	Pits	32.30	36.16
2	Dump	0.00	0.00
3	Road	0.00	1.68

4	**Plantation**	**3.37**	**5.87**
5	**Infrastructure**	**0.18**	**0.18**
6	**Unworked/Unused**	**18.15**	**10.11**
Total		**54.00**	**54.00**

After all the statuary clearance, mining operations is underway, and the present land use has changed in the mine lease area.

1.9 GEOLOGY

The geological formation met within the district are ferruginous chiastolite schist associated argillaceous rocks of Aravalli group, Alwar quartzite of Delhi system, Malani suite of volcanics of lower Vindhyan age, Older alluvial deposits of Quaternary age and Aeolian sands of recent age the out crops are, however, limited to small parts of the district, Older alluvium occurs extensively in the area consisting of inter bedded , lenticular, interfingering deposits of gravel sand ,silt, clay and Kanker mixed in various proportions. The youngest formations are Aeolian deposits, which are unconsolidated surface sands covering large area in the western part of the district, these deposits occur as sand dunes at the surface and consist of sands.

The detailed stratigraphic sequence of the Delhi Super group of rocks in Haryana is given below:

Age	Super Group	Group/Formation	Lithology
Quaternary		Older and Newer Alluvium and Aeolian Deposits	Grey and brown sand, silt, silt-clay, clay with calcrete, limestone and gypsum.
Tertiary	Siwalik Super Group	Upper Siwalik	Boulder conglomerate, sandstones, clay/ mudstone and pebble beds.
		Middle Siwalik	Sandstone with variegated clay/mudstone.
		Lower Siwalik	Sandstone, mudstone/ shale
		Sabathu	Fine-grained sandstone, clay and limestone.
Pre-Tertiary (?)		Tundapathar 'Series' Lower (Paleozoic Unconformity)	Stromalitic limestone, Tosham rhyolite, Granite (Erinpura), migmatite, ultramafic and pegmatite.
Proterozoic	Delhi Super Group	Ajabgarh Group (Divided into 5 Formations)	Quartzite and basic flows, mica-schist, carbonaceous phyllites and slates, calc-schist, dolomite, marble, calc-silicate, amphibolite, hornblende-schist, phyllite.
		Alwar Group	Quartzite, conglomerate, amphibolite, mica-schist and arkosic quartzite.

Figure 1.7: Stratigraphic succession of the Haryana District (Source: GSI).

1.9.1 GEOLOGY OF THE STUDY AREA

Geologically rocks of the allotted area are belonging to Alwar Group. Quartzite is the major litho-unit in the area.

The following sequences have been observed in the area:

- Alluvium
- Quartzite (Stone along with Associated minor minerals)

Quartzite is a type of formation covers the major part of the hills in the area. It is reddish, bluish and gray in color, semi friable to hard and fine grained in nature. Quartzite occurs mostly as building stone extending the entire length and width of the lease area. The stratigraphic sequence of the litho-unit present in the area is as follows:

Table 1.4:
Stratigraphy of the Study Area

Sub Recent-Recent	-	Alluvium
Alwar Group	Bayal-Panchnota Formation	Hard, Black, Banded Hematite Quartzite of varying thickness

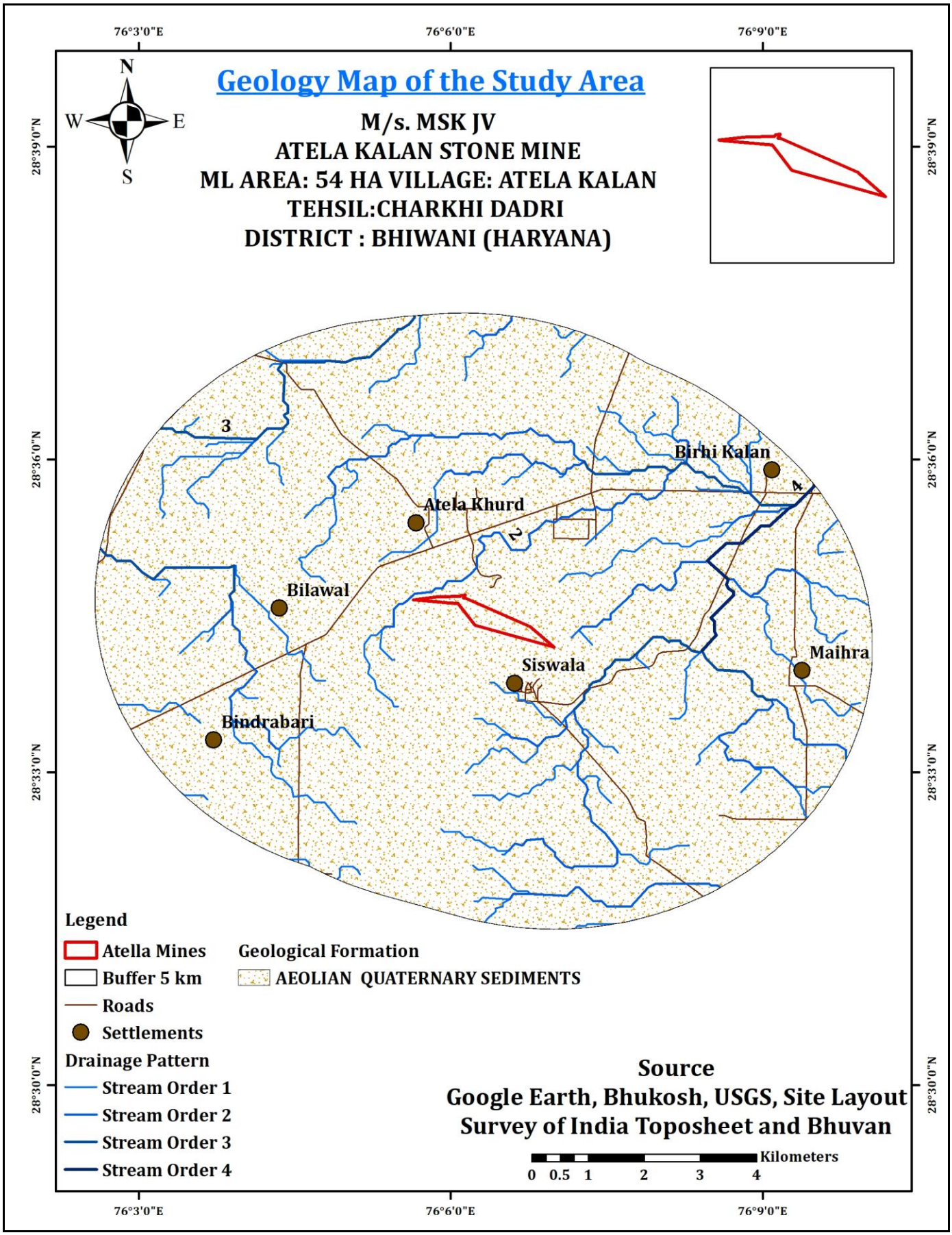


Figure 1.8: Map showing Geological Formations of `5 km Buffer Zone, Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: Bhukosh)

1.10 GEOMORPHOLOGY AND STRUCTURE

Geomorphologically the study area can be broadly divided into four following topographic divisions

- Pediment Pedi plain Complex
- Low dissected hills and Valleys
- Aeolian Dune complex
- Highly dissected hills and Valleys
- Older Alluvial Plains

The Geomorphology map of the study area is given in ***Figure 1.9.***

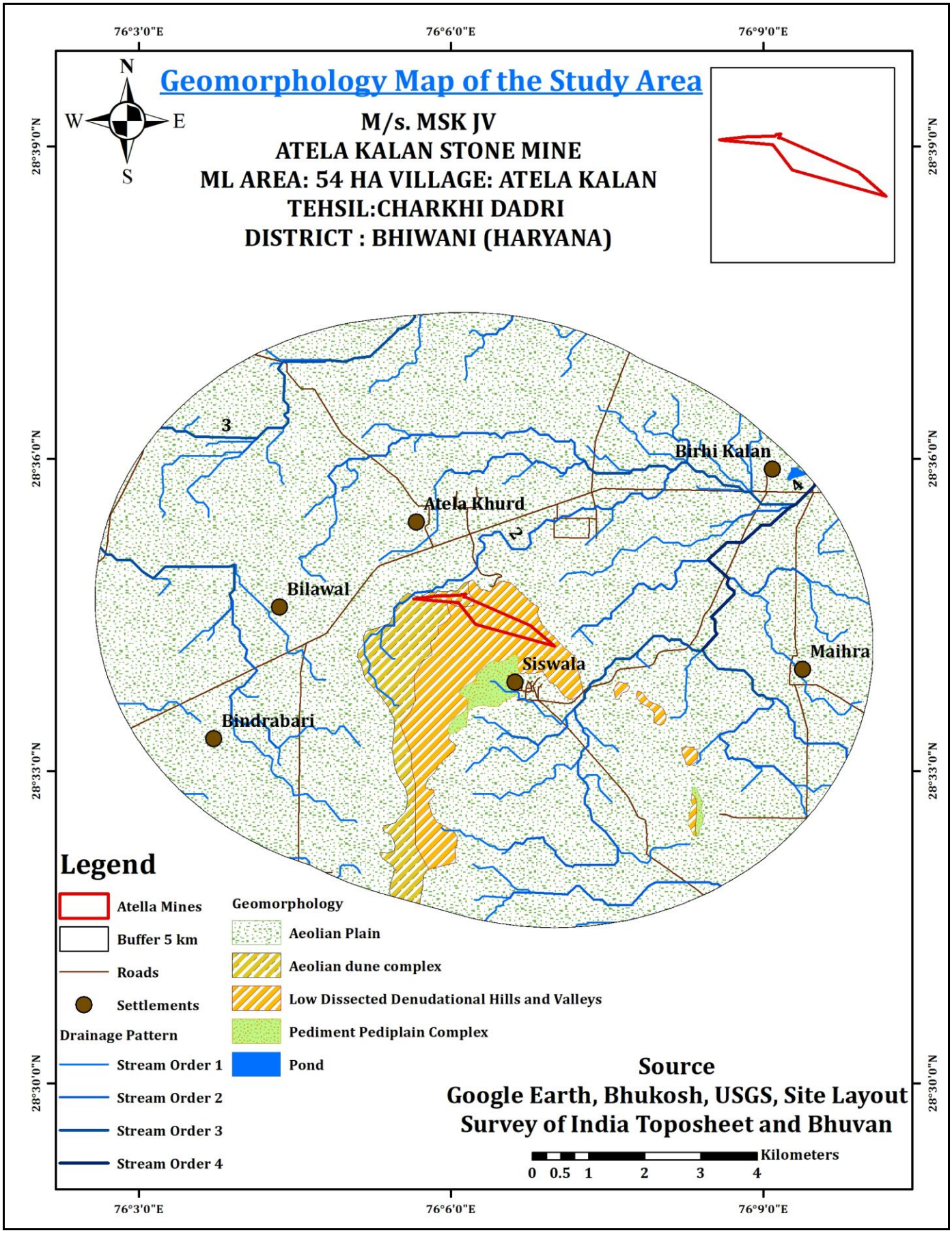


Figure 1.9: Map showing Geomorphology of 5km study area of Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: Bhukosh)

1.11 REGIONAL HYDROGEOLOGY

Ground water occurs in alluvium and Aeolian sands and underlying jointed and fractured hard rocks formations also form the aquifers, in alluvium, sands, silt, kankar and gravel form the water bearing zones. In-shallow aquifers zones, ground water occurs under water table conditions whereas in the deeper zones, confined/semiconfined condition exist, hard rocks comprising of Aravalli group of rocks, Malani suite of volcanics and Alwar Quartzites of Delhi system are water bearing but have yet not been explored thoroughly. In alluvium granular zones exist down to its entire thickness which is of negligible thickness near the out crops as revealed by the litholog of boreholes.

1.11.1 HYDROGEOLOGY OF THE STUDY AREA

The groundwater in the area occurs under unconfined, semi-confined and confined conditions. In the unconfined state the ground water occurs in the zone of saturation in the pore spaces of granular beds. The top granular zone which consists of sand, silt and Kankar, forms a phreatic aquifer. This aquifer group acts as a major source of water supply to open wells, hand pumps and shallow tube wells. Being the only freshwater aquifer in the area, it holds almost the entire groundwater development activities and is under severe stress due to the impact of anthropogenic activities. In the semi-confined and confined condition, the groundwater occurs below a confining layer. The middle and lower aquifer groups have alternate bands of clay and sand of pinching and variable thickness. In Quartzite formation, occupying the north- western part of the district, groundwater occurs in weathered and jointed fractured horizons. Weathering and fracturing has resulted in formation of semi-consolidated sand beds which form potential aquifer zones. This quartzite formation has not been explored for groundwater occurrence. In alluvium, granular zones are evenly distributed in entire thickness which is negligible near the quartzite outcrops.

Groundwater monitoring can be defined as the scientifically-designed, continuing measurement and observation of the groundwater situation. It should also include evaluation and reporting procedures. Within a monitoring programme, data on groundwater are to be collected as far as possible at set locations and regular time intervals. Although the legal basis, institutional framework and funding situation will impose their own objectives and constraints, still the

underlying scientific or technical objective is to describe the groundwater situation in space and time

A detailed groundwater level monitoring has been carried during pre-monsoon season from different locations within buffer zone from existing bore wells. Photographs of monitoring of groundwater regime are already given in figures given below while complete hydro-geological details are presented in **Table 1.5 and Table 1.6**. Based on field investigation, contour map for depth to water level (m bgl) and depth to water level (m amsl) for core and buffer zone has been prepared**.**

In this mining the top level at 401 mRL and surface level at 239 mRL, hence height of lease area is 162 m above ground. The ground water table of the project site ranges from 105-110 bgl (129-134 mRL). The depth on mining at the end of 5th year will be 21 m (218 mRL) and ultimate depth of mining will be 54m (185 mRL) from the surface, hence the water table will not intersect during the entire mine life.

Depth to water level in study area was found to vary between 90 m to 110 m bgl indicating water level to be relatively deep and poor availability of ground water. Though as per HWRA ground water is found to be moderately swallow zones of the perched aquifer condition in which limited access of water is available and its ranges between 50-55 m bgl. The minimum and maximum surface elevation of monitoring points in the study area is found to vary between 226 mRL to 271 mRL respectively. However, in and around mine lease boundary. The pre monsoon water level of the mine site is 110 m bgl whereas the post monsoon water level is 105 m bgl.

Table 1.5:

Details of Site elevation, Water Level and Working Depth of the Mine

S. No	Particulars	AMSL (m)	m bgl	Remarks
1	Site Elevation	170-400	-	-
2	General Ground Level	239	0	-
3	Working Depth_Plan Period	218	21	No intersection
4	Working Depth_Conceptual Period	185	54	
5	Ground Water Level	134-129	105-110	-
6	Pre-Monsoon Water Level	129	110	-
7	Post Monsoon Water Level	134	105	-

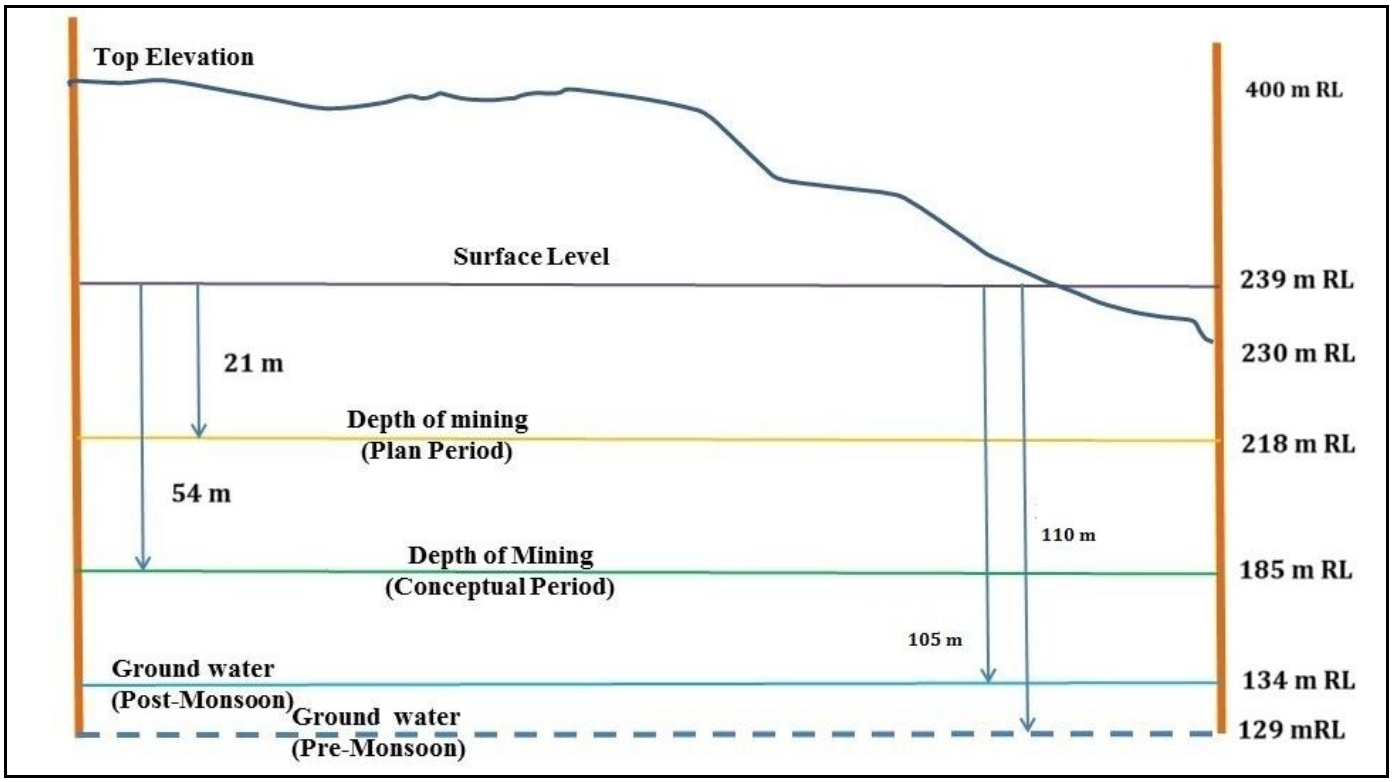


Figure 1.10: Schematic Diagram of the Mine Site

Table 1.6

Details of Groundwater Level Monitoring in and around 5 km Buffer Zone and its outside, Atela Kalan Stone Mine (ML Area: 54 Ha)

S. No	Village	Latitude	Longitude	Elevation	Water Level_Pre Monsoon (m bgl)	Water Table_Pre Monsoon (m bgl)
1	Birhi Kalan	28.60	76.15	226.00	110	116.00
2	Maihra	28.57	76.16	237.00	97	140.00
3	Bilawal	28.58	76.07	262.00	108	154.00
4	Atela Khurd	28.59	76.09	248.00	107	141.00
5	Siswala	28.56	76.11	255.00	105	150.00
6	Bindrabari	28.56	76.06	271.00	102	169.00
7	Dhokha Hariya	28.61	76.11	233.00	105	128.00
8	West	28.61	76.05	235	92	143.00
9	Rudrol	28.47	76.09	271.00	98	173.00
10	Mandi Hanya	28.54	76.03	267.00	94	173.00
11	Chhapar	28.63549	76.122394	230	102	128.00
12	Kheribatar	28.582686	76.183169	234	96	138.00

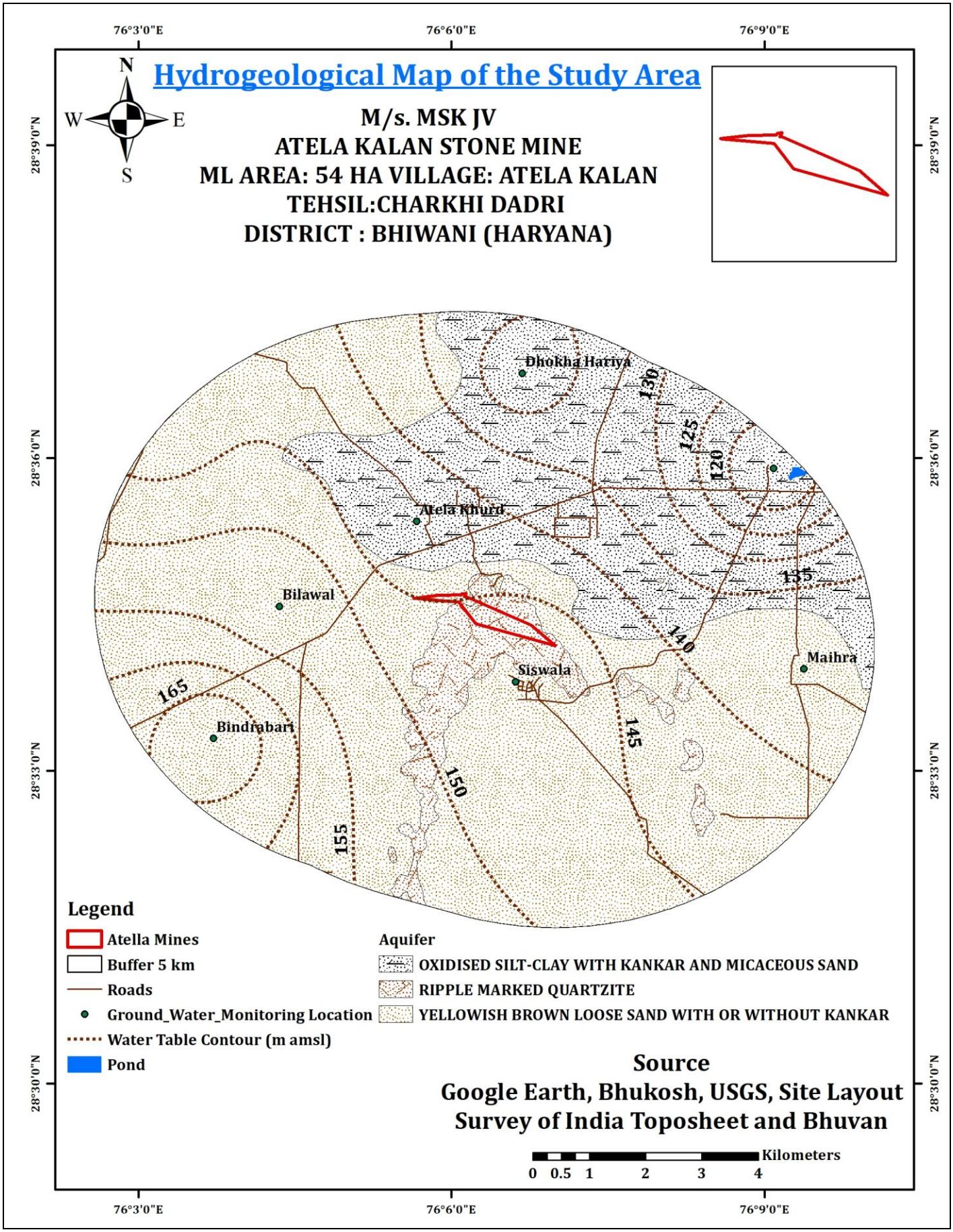


Figure 1.11: Map showing Hydrogeological Formations of 5 km Buffer Zone, Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: Bhukosh)

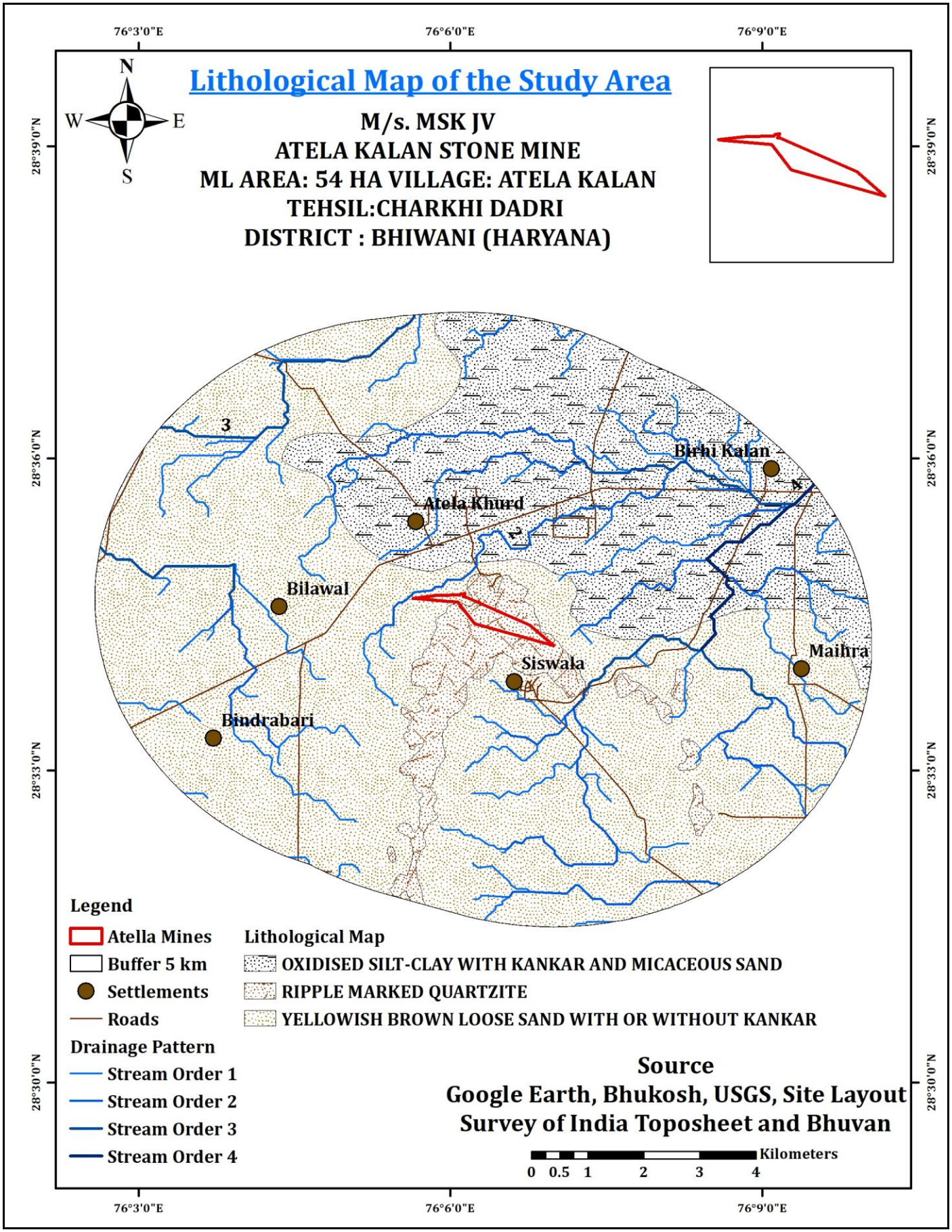


Figure 1.12: Map showing Lithological Formations of 5 km Buffer Zone, Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: Bhukosh)

1.12 ESTIMATION OF GROUND WATER POTENTIAL – 5 KM AROUND MINES AREA

Groundwater Resources of an area can be distinguished under two categories-

- Dynamic Ground Water Resources
- Static Ground Water Resources

DYNAMIC GROUNDWATER RESOURCES

Dynamic groundwater is that amount of water, which is found in the natural zone of fluctuation in an aquifer due to ground water recharge. Total Ground water Recharge (Rt) of the area can be estimated by assessing the various component of the following equation.

Equation: Rt = Rr + Rs+ Ri + Sr +Rc

Where:

Rr= Recharge from Rainfall

Rs = Recharge from irrigation due to surface water

Ri = Recharge from irrigation due to groundwater

Sr = Recharge through surface water bodies

Rc = Recharge to confined aquifer

GROUND WATER RESOURCES FOR BUFFER ZONE

Area of buffer zone is coming about 82.8388 sq.km. This buffer zone has Quartzite and Alluvium as the main aquifer. Main recharging factors in this area is recharge due to rainfall, due to return flow from the applied irrigation from surface and groundwater and recharge form the surface water bodies. Geographical area, specific yield and infiltration index are the parameters for determining the amount of water which is stored in the aquifer.

RECHARGE DUE TO RAINFALL

A. BY GROUNDWATER TABLE FLUCTUATION METHOD

RECHARGE IN BUFFER ZONE BY WATER LEVEL FLUCTUATION METHOD	
Description of items	**Quantity**
1. Area (sq.km)	82.8388
2. Water Table Fluctuation (m)	1.2
3.Specific Yield	16%
4.Total Ground water Storage [(1) *(2) *(3)] (Mcum)	82.8388*1.2*0.16
5.Total (M cum)	15.91

B. BY RAINFALL INFILTRATION FACTOR

RECHARGE IN BUFFER ZONE BY RAINFALL INFILTRATION FACTOR METHOD	
Description of items	**Quantity**
1.Area (sq.km)	82.8388
2. Average Annual Rainfall (m)	0.627
3.Rainfall infiltration factor	24%
4.Rainfall recharge in Buffer zone by Rainfall Infiltration Factor Method	82.8388*0.627*0.24
Gross Rainfall Recharge (Mcum)	12.46

As per the recommendations of Groundwater Estimation Committee (GEC), 2009, if the difference between the two, expressed as a percentage of rainfall infiltration method is greater than or equal to -20% or less than or equal to +20%, then the recharge is taken as the value estimated by the water table fluctuation method. If it is less than -20%, then it is taken as 0.8 times the value estimated by rainfall infiltration factor method. If it is greater than +20%, then recharge is taken as equal to 1.2 times the value estimated by rainfall infiltration factor method.

RAINFALL RECHARGE IN BUFFER ZONE AFTER COMPARING RESULTS FROM WATER LEVEL FLUCTUATION METHOD AND RAINFALL INFILTRATION FACTOR METHOD	
Description of items	**Quantity**
1. Rainfall Recharge during monsoon season in Buffer Zone	
a. By Water Level Fluctuation Method (Mcum)	15.91
b. By Rainfall Infiltration Factor Method (Mcum)	12.46
2. Difference between (1a) and (1b) expressed as a percentage of (1b), 'PD' [{(1a) – (1b)/ (1b)} *100]	27.69%
3. Rainfall Recharge in the Buffer Zone during monsoon season (Mcum) [=(1a) if 'PD' is between-20 and+20% =0.8*(1b) if 'PD' is less than-20% =1.20*(1b) if 'PD' is greaterthan+20%]	14.95

TOTAL RECHARGE OF BUFFER ZONE

NET ANNUAL GROUND WATER AVAILABILITY IN BUFFER ZONE	
Description of items	**(Mcum)**
Rainfall Recharge in Buffer Zone	
1.Rainfall Infiltration Method	14.95
2. Recharge from 'Other Sources'	
A. Return flow to Ground water system (30%) through Irrigation	1.62
B Recharge through surface water bodies in the area	0.43
Total Annual [(2a) +(2b)]	2.05
Gross Annual Groundwater recharge	17.00

GROUND WATER DRAFT OF BUFFER ZONE [E.G. IRRIGATION METHOD, NUMBER OF WATERING, WATER SUPPLY ETC.]

In the investigated area, groundwater draft will occur mainly due to applied irrigation, domestic and industrial uses. Ground water draft can be computed by reducing the equation (B) to:

DtB = DiB + DdB + DlB + DinB

GROSS ANNUAL GROUND WATER DRAFT FOR 'ALL USES' IN BUFFER ZONE	
GROUND WATER DRAFT	**Mcum**
NET IRRIGATION USE	
Net irrigation use	5.4
COMMUNITY USE	
For domestic purpose	2.01
For cattle population (5% of community use):	0.19
Industrial/Mine use (for all industries/mines falling in the	1.22
Total Community use	3.42
GROSS ANNUAL GROUND WATER DRAFT FOR ALL USES' IN BUFFER ZONE	8.82

SUMMARY OF BUFFER ZONE WATER BALANCE

Stage of Groundwater Development in Buffer Zone	
Description of items	**Buffer Zone**
1 Stage of Groundwater Development	
a. Net Ground water Availability (Mcum)	17
b. Annual Gross Groundwater Draft (Mcum)	8.82
c. Balance Available Annual Groundwater Recharge	8.18
d. Stage of Groundwater Development [{(1b) /(1a)}	52%
e. Category of Groundwater Development	***Safe***

ALLOCATION OF GROUND WATER FOR DOMESTIC USE FOR FUTURE DEVELOPMENT

Domestic use of population within 5 km radius of project site has been projected for year 2041. Considering population growth percentage @25.53% per decade, population in year 2041 is estimated to be 103562 persons. (As per Census data 2021 and its projected growth)

Dependency of population is mainly on the groundwater in this area. Considering 100 litres (0.1 m3) as domestic consumption in rural and semi urban area, the total water withdrawal for domestic use will be:

DdB =103562 x 0.1 x 365 days

= 3.78 mcm/annum

Present draft due to domestic use is 2.01 mcm/annum; hence additional water allocated for future domestic use works out to be 3.78-2.01=1.77 mcm/annum.

Total ground water resource of the buffer zone is 17 mcm/annum while total groundwater draft is 8.82 mcm/annum. The groundwater development in the area is about 52% of total groundwater resources. Therefore, buffer zone is coming under Safe category as per groundwater development status.

In spite of the above clarification the project lies in Charkhi Dadri Assessment Block of Charkhi Dadri District which comes under Safe Category as per CGWB Categorization 2022 as well as HWRA 2022 https://hwra.org.in/Guidelines.html.

So in view of the above the project will not bring any adverse impact to the ground water conditions within 5 km of the study area.

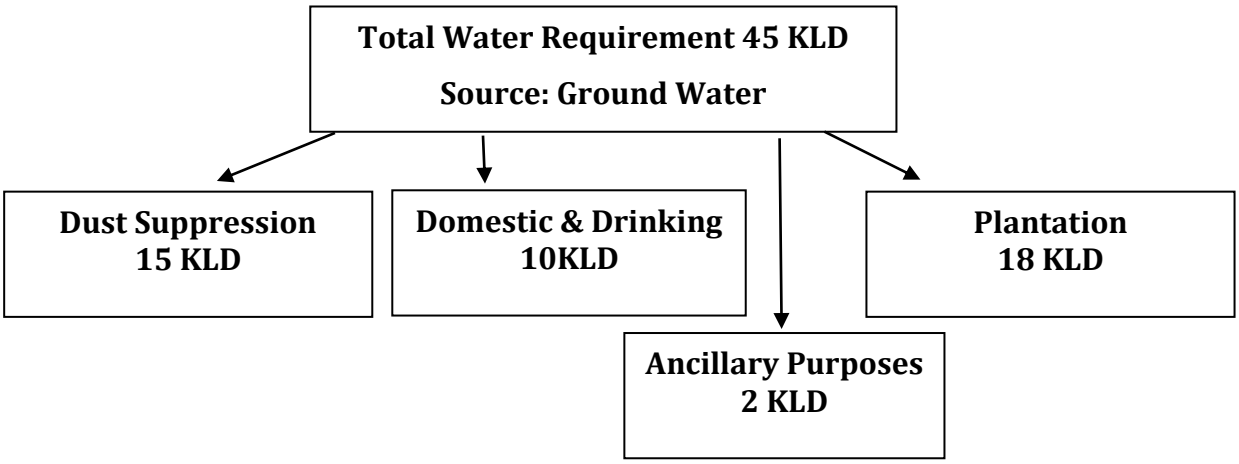
1.13 WATER REQUIREMENT FOR THE MINES

Total water requirement will be 45 KLD and source is ground water through borewells present inside the ML Area. Permission for Ground water utilization from HWRA has been obtained vide letter no. HWRA/NOC/MIN/N/2023/2 dated 06.02.2023 which valid up to 06.02.2024.

About 15.00 KLD of water will be required for Dust suppression and 10.00 KLD for Domestic propose and 18.00 KLD for plantations and 2.00 KLD for other ancillary purposes.

The quality of water (TDS) has been tested in the field using TDS Scan and the quality of bore well water found to be within drinking water standards.

The break-up of water requirement is given below:



FLOW CHART SHOWING WATER BALANCE DIAGRAM

HYDROGEOLOGICAL STUDY REPORT

M/s. MSK JV BY ATELA KALAN STONE MINE (ML AREA: 54 HA) LOCATED AT VILLAGE: ATELA KALAN, TEHSIL: CHARKHI DADRI, DISTRICT: CHARKHI DADRI FORMERLY BHIWANI (HARYANA)

CHAPTER 2

2 EVALUATION OF AQUIFER PARAMETER

Pumping test is the most accurate reliable and commonly used method to evaluate the hydraulic parameters of an aquifer, efficiency of a well / bore well, safer operational rates of pumping and selection of suitable pump. The methods of a pumping test are highly varying in its application. The main objective of pumping test is to determine the aquifer parameters such as Transmissivity (T), Storage Co-efficient (S) Hydraulic Conductivity (K), Well Performance and Safe Yield for execution of water supply.

In order to evaluate the aquifer characteristics, constant discharge test has been conducted in the existing bore well for the pumping test purpose. The draw down and recovery have been observed in the pumping well. The draw down and recovery has been measured.

Pumping Test Methodology

- The constant discharge test has been carried out with the help of tripod and accessories like 5 HP pump and electronic water level indicator etc.,
- During the pumping test, discharge has been measured by volumetric methods and ground water level has been measured using electronic indicator.
- Draw down and recovery have been measured both bore wells and observation wells.

The most important part of the pumping test is measuring the depth of water level at different stages. This could be achieved using the electronic water level indicator. During the initial stage of pumping the frequency of water level measurement should be at closer time intervals and in the later part of the pumping the frequency may be at larger intervals. The time duration adopted for measuring the water level as follows.

Table 2.1:
Pumping test details

S.No.	Time since pumping started	Tape Reading		DTW (mbmp)	Draw Down (m)
		Hold	Cut		
1	1	20	12.9	7.1	0.2
2	4	20	12.6	7.4	0.5
3	5	20	12.2	7.8	0.9
4	6	20	11.9	8.1	1.2
5	7	20	11.6	8.4	1.5
6	8	20	11.4	8.6	1.7
7	9	20	11.3	8.7	1.8
8	10	20	11.2	8.8	1.9
9	12	20	11	9	2.1
10	14	20	10.7	9.3	2.4
11	16	20	10.5	9.5	2.6
12	18	20	10.3	9.7	2.8
13	20	20	10.1	9.9	3
14	25	20	9.8	10.2	3.3
15	30	20	9.6	10.4	3.5
16	35	20	9.3	10.7	3.8
17	40	20	9.18	10.82	3.92
18	50	20	9	11	4.1
19	60	20	8.7	11.3	4.4
20	100	20	8	12	5.1

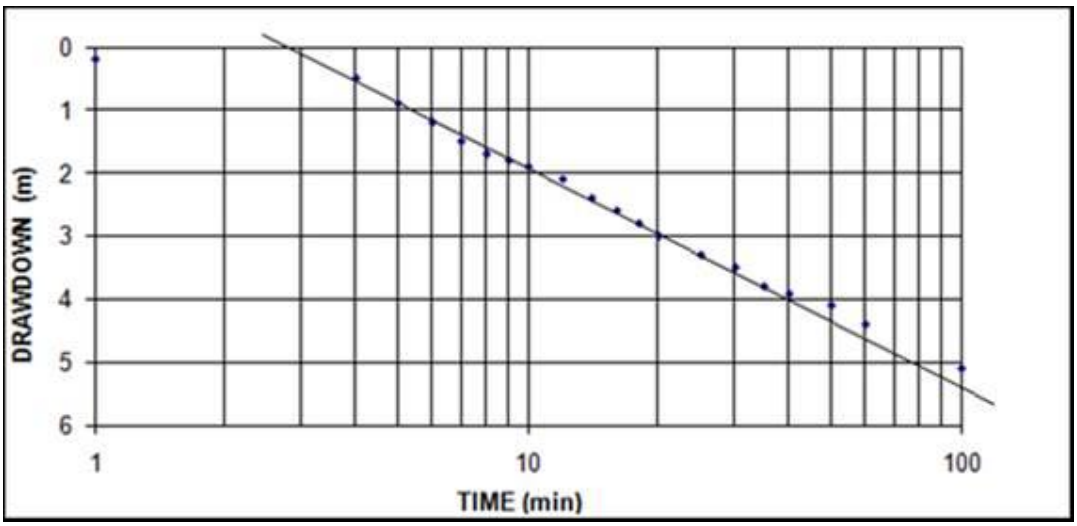
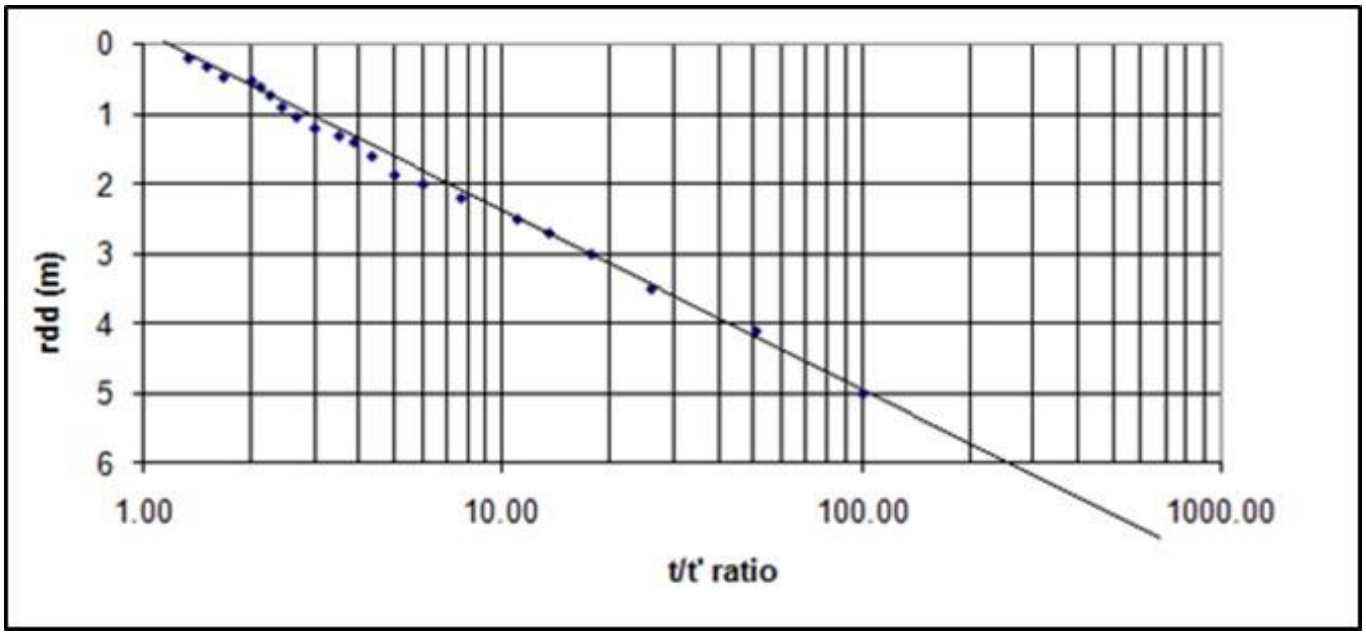


Table 2.2
Recovery test details

Time since pumping started in	Time since pumping stopped in	t/t'	Tape		DTW (mbmp)	RDD (m)
			Hold	Cut		
101	1	101.0	15	3.1	11.9	5
102	2	51.00	15	4	11	4.1

104	4	26.00	15	4.6	10.4	3.5
106	6	17.67	15	5.1	9.9	3
108	8	13.50	15	5.4	9.6	2.7
110	10	11.00	15	5.6	9.4	2.5
115	15	7.67	15	5.9	9.1	2.2
120	20	6.00	15	6.1	8.9	2
125	25	5.00	15	6.23	8.77	1.87
130	30	4.33	15	6.5	8.5	1.6
135	35	3.86	15	6.7	8.3	1.4
140	40	3.50	15	6.79	8.21	1.31
150	50	3.00	15	6.9	8.1	1.2
160	60	2.67	15	7.06	7.94	1.04
170	70	2.43	15	7.2	7.8	0.9
180	80	2.25	15	7.37	7.63	0.73
190	90	2.11	15	7.49	7.51	0.61
200	100	2.00	15	7.58	7.42	0.52
250	150	1.67	15	7.63	7.37	0.47
300	200	1.50	15	7.78	7.22	0.32
400	300	1.33	15	7.9	7.1	0.2



The pumping test data has been analyzed by Jacob's straight line method of the pumping data of the observation well. The calculation is given below.

Formulae: T= 2.3Q/4π/4Δ s & S= 2.25 T t0/r2

On the basis of above formulae, the calculated parameters are as follows.

T= 12.36067 m2/day & S= 9.66X10^{-5}

Recuperation Data:

Formulae: T= 2.3Q/4π/4Δ s & S= 2.25 T t0/r2

On the basis of above formulae, the calculated parameters are as follows.

T= 13.6393636 m2/day & S= 1.07 X10^{-5}

Table 2.3

List of Aquifer Parameters

Particulars	*Pumping*	*Recovery*
Transmissivity	*12.3606 m2/day*	*13.6393 m2/day*
ΔS	*1.6*	*2.0*
Storativity	*9.66*10-5*	*1.07*10-5*
Thickness of the fractured aquifer	*15.45*	*16.8*
Hydraulic conductivity	*0.8 m/day*	*0.81 m/day*

HYDROGEOLOGICAL STUDY REPORT

M/s. MSK JV BY ATELA KALAN STONE MINE (ML AREA: 54 HA) LOCATED AT VILLAGE: ATELA KALAN, TEHSIL: CHARKHI DADRI, DISTRICT: CHARKHI DADRI FORMERLY BHIWANI (HARYANA)

CHAPTER 3

3 PREDICTION OF GROUND WATER INFLOW IN TO THE MINES

The mining will be done by mechanized open cast method using excavators and loaders. The production of mineral will be approx. 85, 00, 000 Tons per year.

The present mining operations are designed to be carried out by open cast mining means in 3 shifts. The entire mining operations are mechanized. Apart of mining, the loading and transportation up to stack yard shall be done mechanically. The load in the trucks/dumpers directly to the destinations and mineral is not usually put up in this stack yard to avoid the double handling. In the present operation the bench height shall be 6 m and bench width 6.5 m with intermediate safety berm of 8 m. Each bench will advance one by one. While carrying out the mining operations in accordance with the above provision the overall pit slope shall be maintained the 49^0 the mineral bearing rocks being hard and compact. It is seen to work the mine by Hydraulic shovel and 25 tones dumpers with bench height 6 m and width 6.5 m. Mining operations will require equipment such as excavator (L&T), loader (JCB), dumpers (Ashok Leyland) etc. all the equipments will be of highest standard of reputed make. This manufacturer itself will take significant care of noise pollution control. Further, a vegetative barrier is also proposed for the purpose. All the equipments will be regularly maintained to keep noise level within the prescribed limit of 65 dB (A) Various mining activities such as drilling, blasting, loading, transportation and crushing is being conducted as to ensure maximum mineral conservation and minimum environmental degradation. After mining activity some area will be reclaimed with the help of overburden/ top soil of 2000 Tons/year

Impact of Mining on Surface Water

There are no seasonal Nallah/Water Bodies inside the mining lease area.

All the mining activity carried out in next three years will not interfere anywhere with the natural drainage pattern. However, to prevent the entry of surface run-off in the active mining pit, following measures are proposed:

- Construction of bund around the pit with soil generated during mining so that rainwater will be channelized towards temporary unused pit/water reservoir.
- No erosion wash off will be directly allowed to go to the Natural System as it will be arrested by constructing Bunds/ Check dams/ check filters.
- Garland drains will be provided all around the excavation to prevent flow of surface rainwater/runoff from surrounding areas in the working pit.
- The drains shall be lined with stone masonry and shall be of adequate size to carry the storm water without overflow.
- The rain water which will get accumulated in working pit will be pumped out by diesel pump of adequate capacity.
- The rainwater collected in the excavated out area or in mine sump shall be utilized for water spraying on haul roads and other dust prone areas, greenbelt development and other purposes.

Moreover, no stored water shall be released directly to streams. Clean and clear water will be discharged. Check dam will be provided to prevent siltation to discharge. Hence, there is no possibility of any siltation in natural streams and reduction of vertical percolation. It is therefore apparent that there is no significant impact of mining on the surface water regime.

MINING OPERATIONS AND GROUND WATER DYNAMICS

The impact of mining on ground water is generally described through the standard practice of prescribing the Environmental Impact Statement (EIS) which should include an assessment of the potential environmental harm caused by the mining to local groundwater resources. The impact assessment will define the extent of the area within which groundwater resources are likely to be affected by the proposed operations to groundwater depletion or recharge and propose management options available to monitor and mitigate these effects. The Environmental Impact Statement (EIS) shall be based on the review of the quality, quantity and significance of groundwater in the area, together with groundwater use in neighboring areas. The review shall include a survey of existing groundwater supply facilities (bore wells, or excavations) to the extent of any environmental harm.

Recognition of groundwater regime in and around the open pit and hydraulic properties of layers in the mine vicinity is important to control water inflows to

mine. To design an effective dewatering system for an open pit mine, the modelling of water related problems and prediction of water inflow into a pit is necessary. The results of such simulations would be used to develop an appropriate water management strategy in order to minimize the operational problems below the water surface and long-term environmental problems, in the feasibility stage of mine design.

In the mining operations carried out below the water level, mine operators are potentially faced with two important water-related problems which includes

- The amount and pressure of groundwater that could flow into an open pit and
- The effect of pore water pressure on the stability of an open pit high wall.

Whenever a mine is operated below the water level, water seepage occurs from the surrounding layers towards the mining excavation. In order to design an effective drainage scheme for an open pit mine, prediction of water inflow into the pit is essential. Excavation of a large open-pit mine below the water level can affect the operational efficiency and economic viability of the mining operation. The unexpected water flows in large scale may reduce the production, delay the time of execution and danger the total mine safety (Hanna et al., 1994). When a pit penetrates in an aquifer, the significant amounts of groundwater flow occur to a pit. Therefore, the large volumes of water must be pumped to provide a dry mining condition. Figure 3.1 shows the water inflow components into a pit.

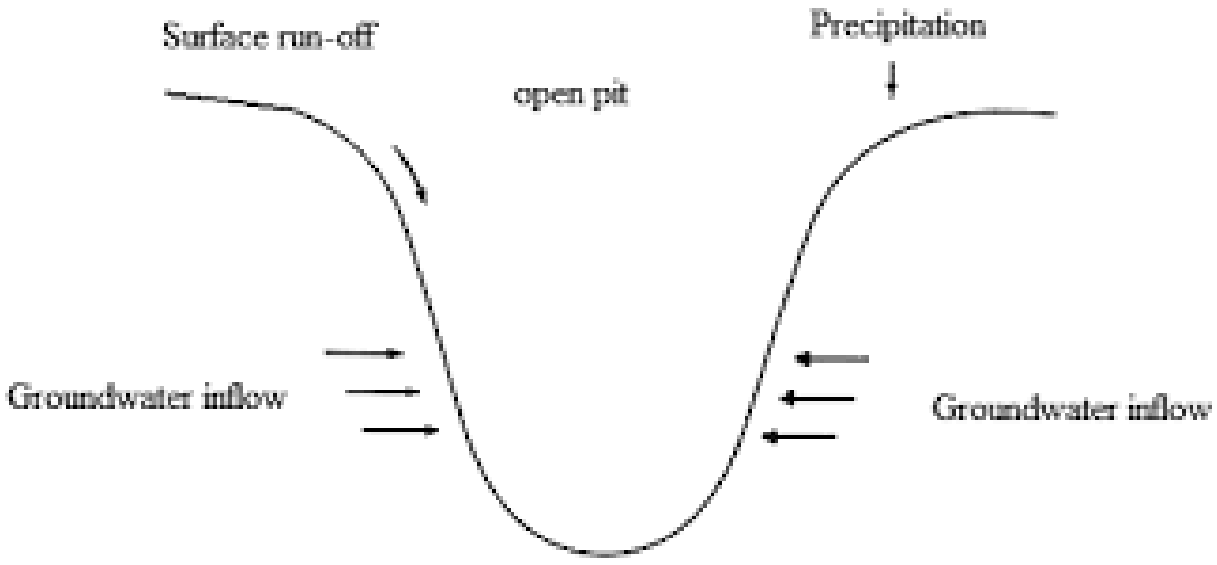


Figure 3.1: Water Inflow Components into an Open Pit

ESTIMATION OF MINE SEEPAGE

Estimation of water inflow to a surface mining operation is a necessary requirement for mine drainage design. Water inflow in a shallow surface mining may originate solely form a surface source and from the atmosphere in the form of precipitation. However, depending upon the depth of mining the water inflow contribution from ground water flow may be a significant component. In flow from surface sources and precipitation are generally estimated using hydrological balance equations, using the catchment characteristics and several empirical formulae are available in literature. Assuming the extent of contribution from surface sources and precipitation, the mine plan usually incorporates measures to divert these water through garland drains designed considering the slope and it is ensured that the water do not outlet in to the mine pits. Hence, the most important and critical component of mine water inflow remains is seepage from ground water, which needs to be carefully and rationally estimated so as to plan the dewatering mechanism to allow mining activity.

Many analytical solutions for prediction of water inflow into mine excavations can be found in the literature (Hanna et al., 1994; Shevenell, 2000; Singh and Atkins, 1985a, b; Marinelli and Niccoli, 2000); these models often were developed based on some very specific assumptions and boundary conditions that restrict their applicability in many mining situations. The prediction of the amount of water inflow into a pit is very important for development of a mine dewatering program. The ground water flow in the mine pit can be estimated by one of the techniques:

- Equivalent flow approach
- Two dimensional flow equation
- Numerical Techniques through simulation

Accurate estimation of groundwater inflow to mine excavation is important and generally accomplished through analytical approach adopting the equivalent flow approach (**Figure 3.2**).

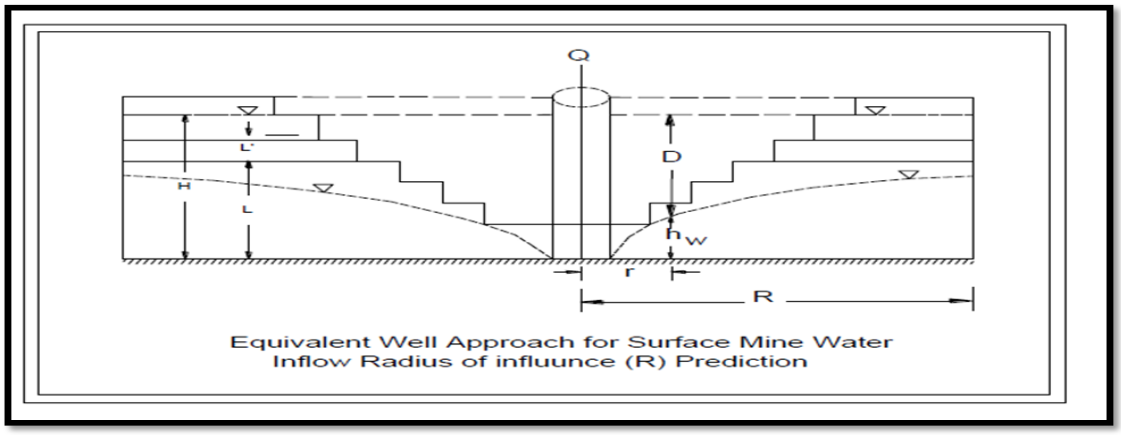


Figure 3.2: Schematic Diagram of Zone of Influence

Numerical modelling requires huge data and skill, however the complexities and in homogeneity can be better approximated in numerical modelling.

The numerical groundwater modelling approach also involves predictive simulation to determine the potential magnitude and extent of the impact of mining on the surrounding groundwater system, including the potential impact on neighbouring groundwater users.

In the present context, an attempt has been made to assess the mine seepage as per mine plan both with depth and time and quantification of computation of mine water inflow and radius of influence. Effort has also been made to plan the details of utilization of water being pumped out along with quantification of its various uses. Further, with the help of analytical techniques and statistical analysis of water level observations attempt has been made to study the impact of mining on ground water regime, both with depth and time as well as on surface water sources in the surrounding areas and suggest mitigation measures.

The open cast mining generally is carried out below local water level conditions. Under these circumstances groundwater accumulates in the mine pit. The quantity of the groundwater that can accumulate in the pit bottom is governed by the aquifer properties and their lateral extent. Groundwater seepage along with accumulated rain water shall be pumped out from Mine pit to facilitate mining and to utilize for different purposes. This withdrawal is resulting in development of a zone of water depression around the mining pit.

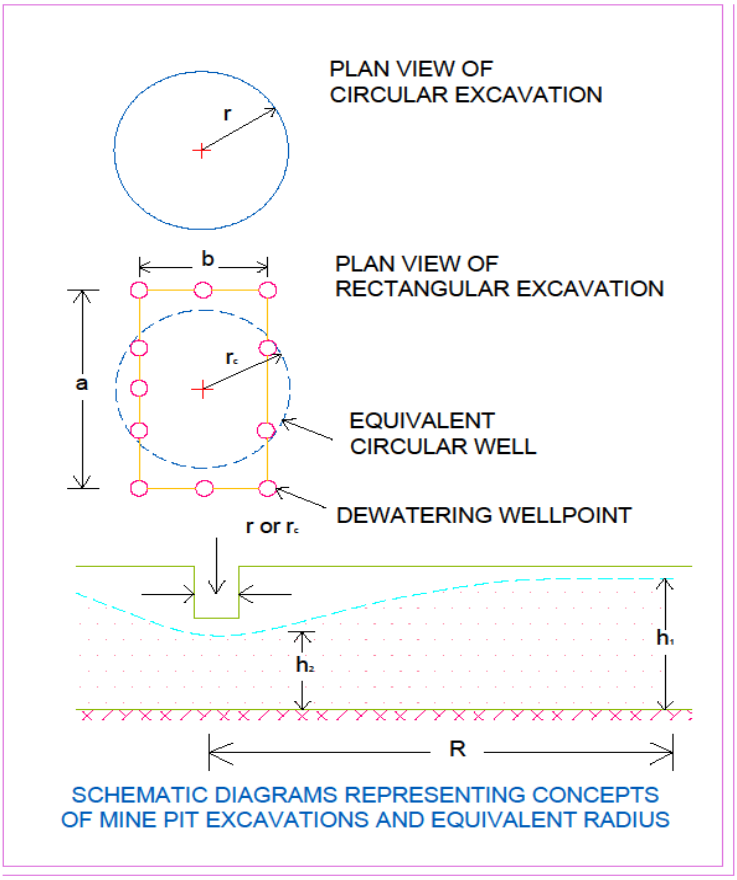


Fig. 3.3: Radius of Influence

The mining operations are invariably governed by certain environmental laws in order to minimize their impacts on the natural resources in the vicinity. Groundwater regime around the mining lease is one of such natural resources, which come under the purview of the environmental law implementation. Under this law the mining operation should not cause significant decline in the groundwater levels. In order to find lateral extent of such groundwater lowering around the active open cast mining involving dewatering several scientific methods can be adopted. Few of the relevant and important methods are describe in the following paragraphs:

Well equation method:

The radius of influence of the pumping from mining pit can be worked out from the following formula which is often used in such calculations. The relevant equation is as under.

Autor	Referencia	Fórmula Radio de Influencia
Lembke	(1886, 1887)	$R = h_o \times \sqrt{\frac{K}{2N}}$
Weber	[Kyrieleis-Sichardt ,1930]	$R = 3 \times \sqrt{\frac{h_o \times K \times t}{n_e}}$
Kusakin	Chertusov, 1949	$R = 575 \times s_w \times \sqrt{K \times h_o}$
Kusakin	Aravin y Numerov, 1953	$R = 1{,}9 \times \sqrt{\frac{h_o \times K \times t}{n_e}}$
Sichardt	[Kirieleis-Sichardt, 1930]	$R = 3000 \times s_w \times \sqrt{K}$

Source: https://www.hatarilabs.com/ih-en/overview-of-the-radius-of-influence

Webber method:

The expression required for estimating the radius of influence zone in this method is written as:

$$R = 3 \times \sqrt{\frac{h_o \times K \times t}{n_e}}$$

Mining Area with no ground water seepage

Impact of Mining on Groundwater

The allotted area is undulating, and country rock is hard, so the runoff water is fast and percolation of water is less. All the surface water will flow down towards Northeastern direction to its natural slope.

In this mining the top level at 401 mRL and surface level at 239 mRL, hence height of lease area is 162 m above ground. The ground water table of the project site ranges from 105-110 bgl (129-134 mRL). The depth on mining at the end of 5th year will be 21 m (218 mRL) and ultimate depth of mining will be 54m (185 mRL) from the surface, hence the water table will not intersect during the entire mine life.

Depth to water level in study area was found to vary between 90 m to 110 m bgl indicating water level to be relatively deep and poor availability of ground water. Though as per HWRA ground water is found to be moderately swallow zones of the perched aquifer condition in which limited access of water is available and its ranges between 50-55 m bgl. The minimum and maximum surface elevation of monitoring points in the study area is found to vary between 226 mRL to 271 mRL respectively. However, in and around mine lease boundary. The pre monsoon water level of the mine site is 110 m bgl whereas the post monsoon water level is 105 m bgl.

According to groundwater level monitoring data and as per Hydrogeological site visit water level is found deeper in the applied lease area. Depth to water level in and around mine lease area is found to vary between 105m during post monsoon season and 110 m during pre-monsoon season. The mineral availability and depth of mine working will go up to 21m bgl (218m RL) in present plan period and up to 54 m bgl (185 mRL) in conceptual period. Hence, there is no possibility of groundwater intersection by mine workings, or groundwater seepage in the mine pits either in the plan period or during conceptual period.

There will not be any adverse impact on the groundwater quality due to mining. The mineral formations do not contain any harmful element, which could percolate into the ground and pollute the groundwater. Hence, no control measures are required.

PLAN FOR REDUCTION OF GROUND WATER

- The water accumulated in the mine pit will be utilized in various mining activities.
- During the conceptual stage the water accumulated in the mining pits will be distributed to villagers for agricultural usages as the main occupation of the area is agriculture.

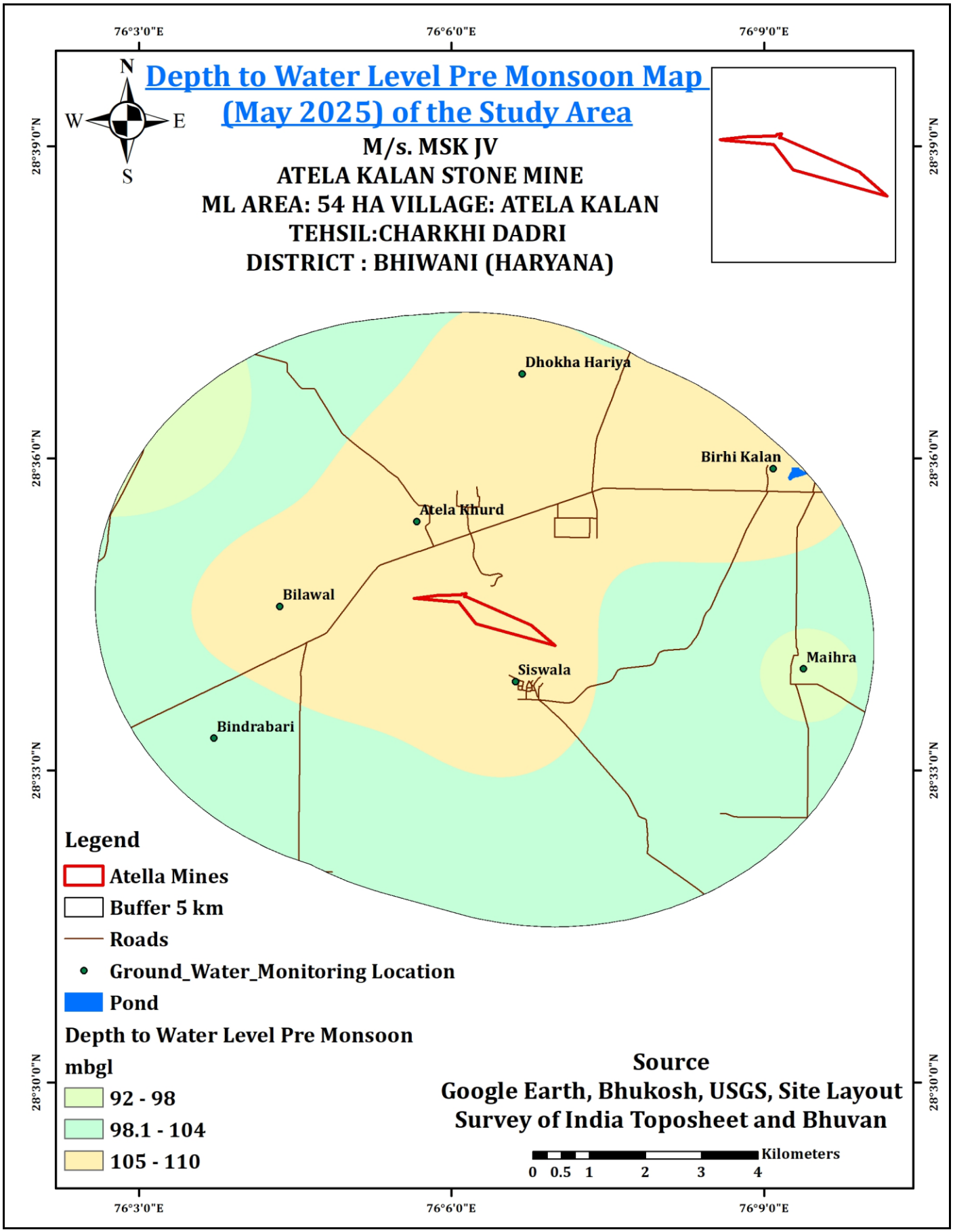


Figure 3.1: Depth to Water Level (mbgl) in Buffer Zone, Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: Field Survey)

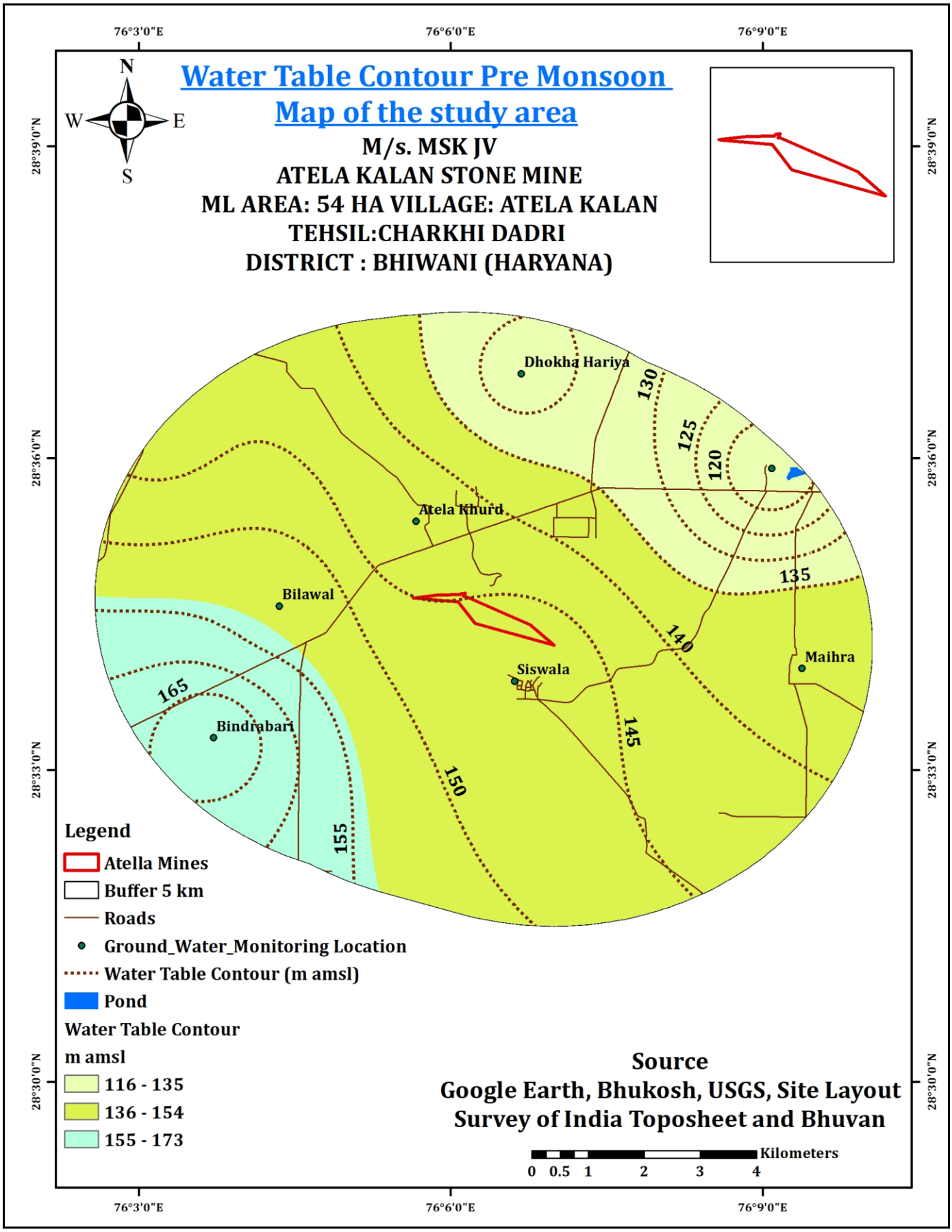


Figure 3.2: Water Table (amsl) in Buffer Zone, Atela Kalan Stone Mine (ML Area: 54 Ha)

(Source: Field Survey)

3.1 GW QUALITY OF THE MINE AREA AND ITS BUFFER

Ground water quality plays an important role in the development. The quality of ground water is as important as its quantity. The most extensive use of ground water is for irrigation of crops and a part of the ground water potential is for domestic and industrial uses. With the advent of industrialization and inadequate attention paid to protect the environment degradation in water quality one of the challenges of modern time. Sometimes the excess mineralization exceeds the maximum permissible limit for human consumption. Followings are the factors affecting the chemical quality of ground water.

- Physiochemical characteristics of the rocks through which ground water is circulating.
- Geological environment of the area.
- Climate of the area.
- Role of microorganism.
- Chemical physical and mineralogical characteristic of the soil through which Meteoric water percolate to the underground reservoir.
- Topography of the area.
- Mixing of connate water.
- Manmade pollution due to excessive use of manure, pesticides, harmful disposal of industrial and sewerage of urban area etc.

The Ground water quality maps are prepared based on the ground water sample collected from the mine site and its buffer area and analyzed in NABL accredited Laboratory and illustrated below:

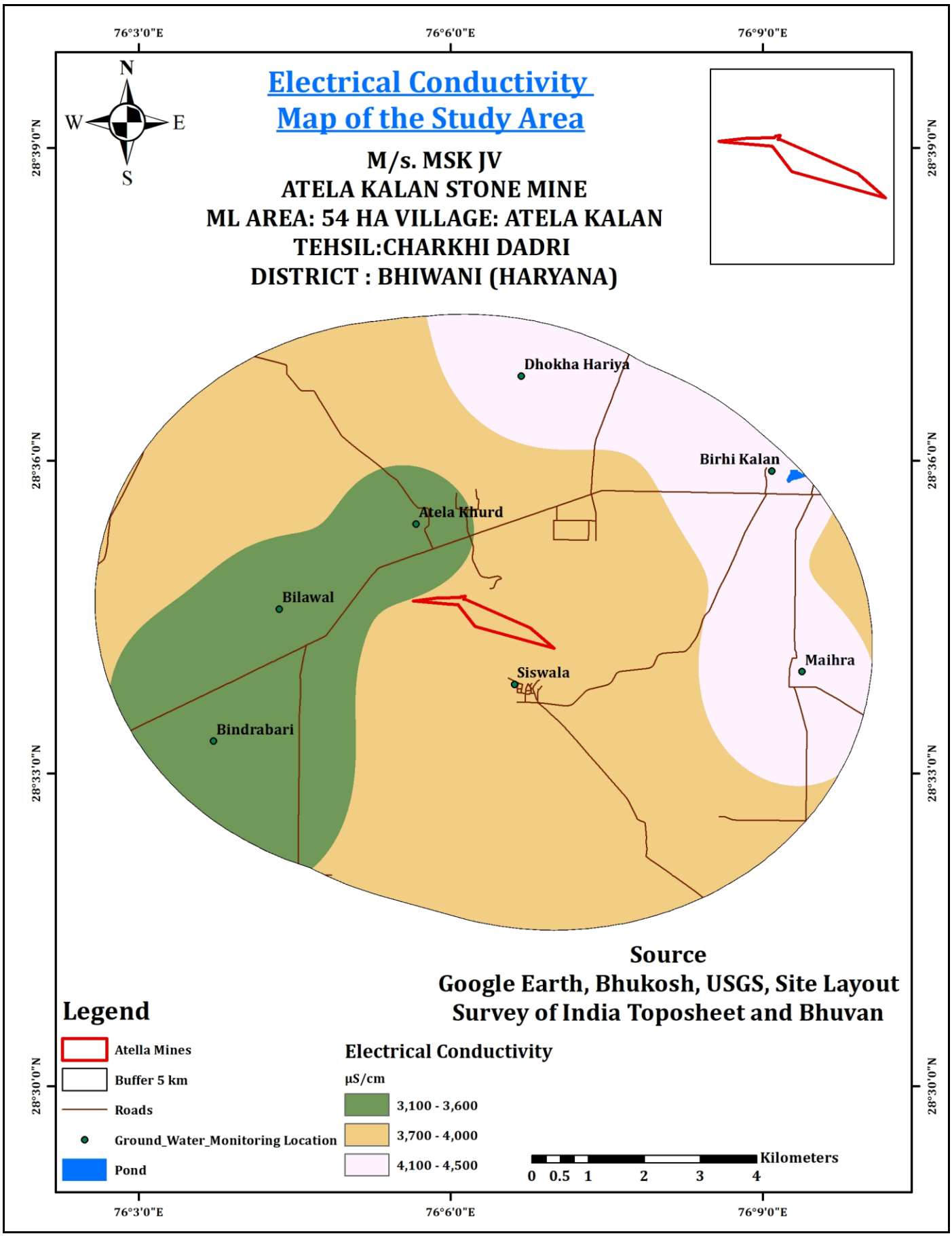


Figure 3.3: Electrical Conductivity Map (µS/cm) in Buffer Zone, Atela Kalan Stone Mine (ML Area: 54 Ha) (Source: Field Survey)

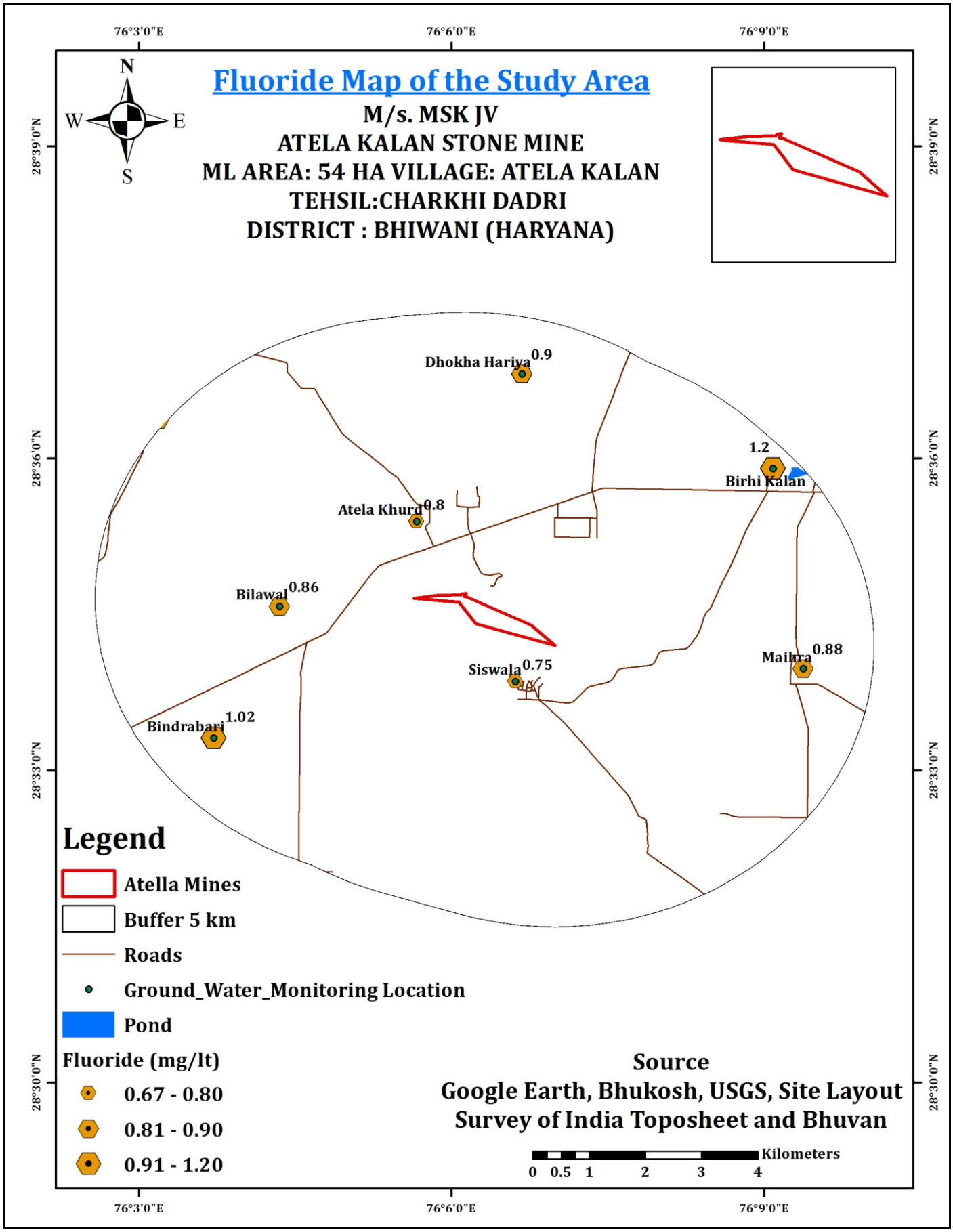


Figure 3.4: Fluoride Map (mg/lt) in Buffer Zone, Atela Kalan Stone Mine (ML Area: 54 Ha)

(Source: Field Survey)

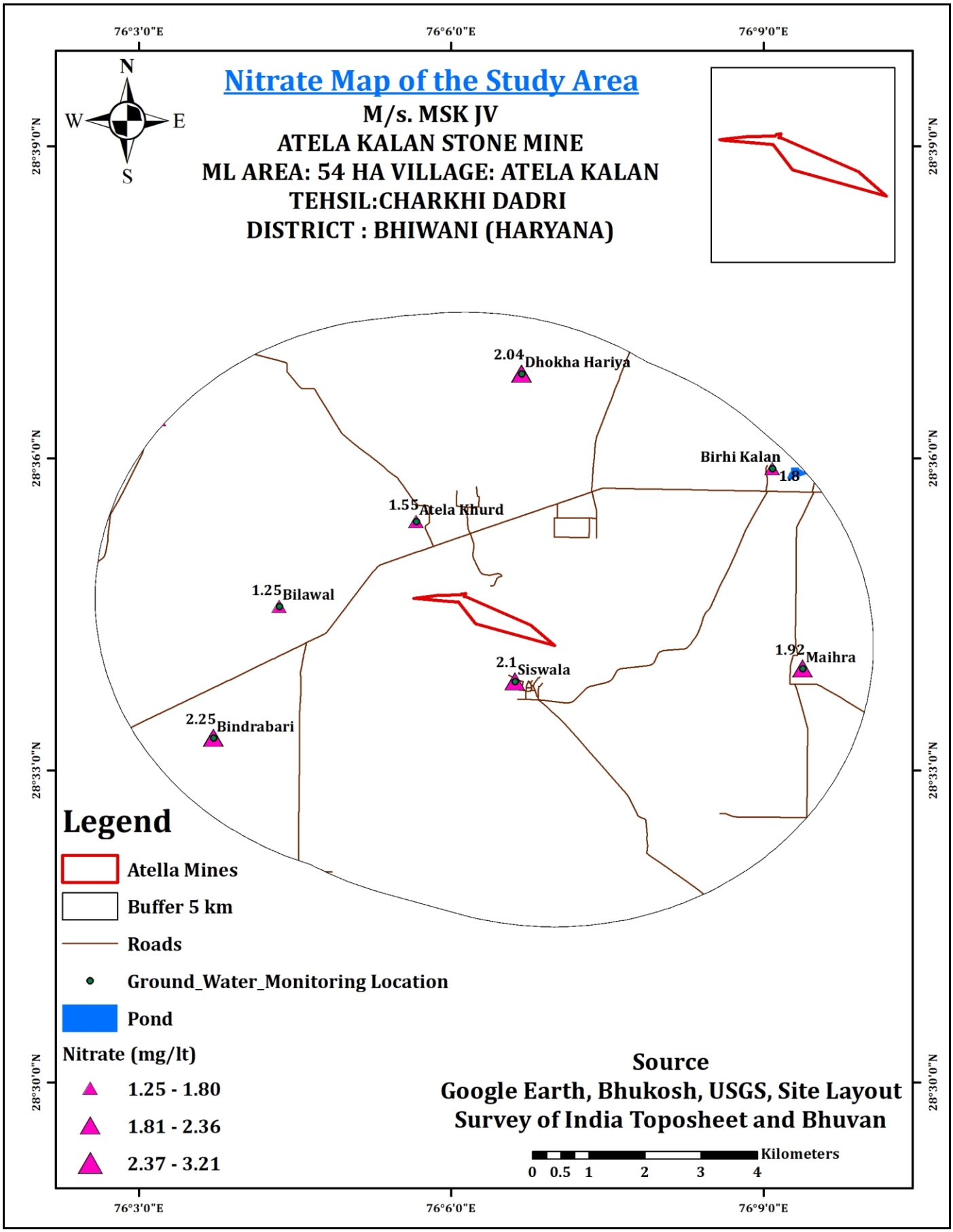


Figure 3.5: Nitrate Map (mg/lt) in Buffer Zone, Atela Kalan Stone Mine (ML Area: 54 Ha)

(Source: Field Survey)

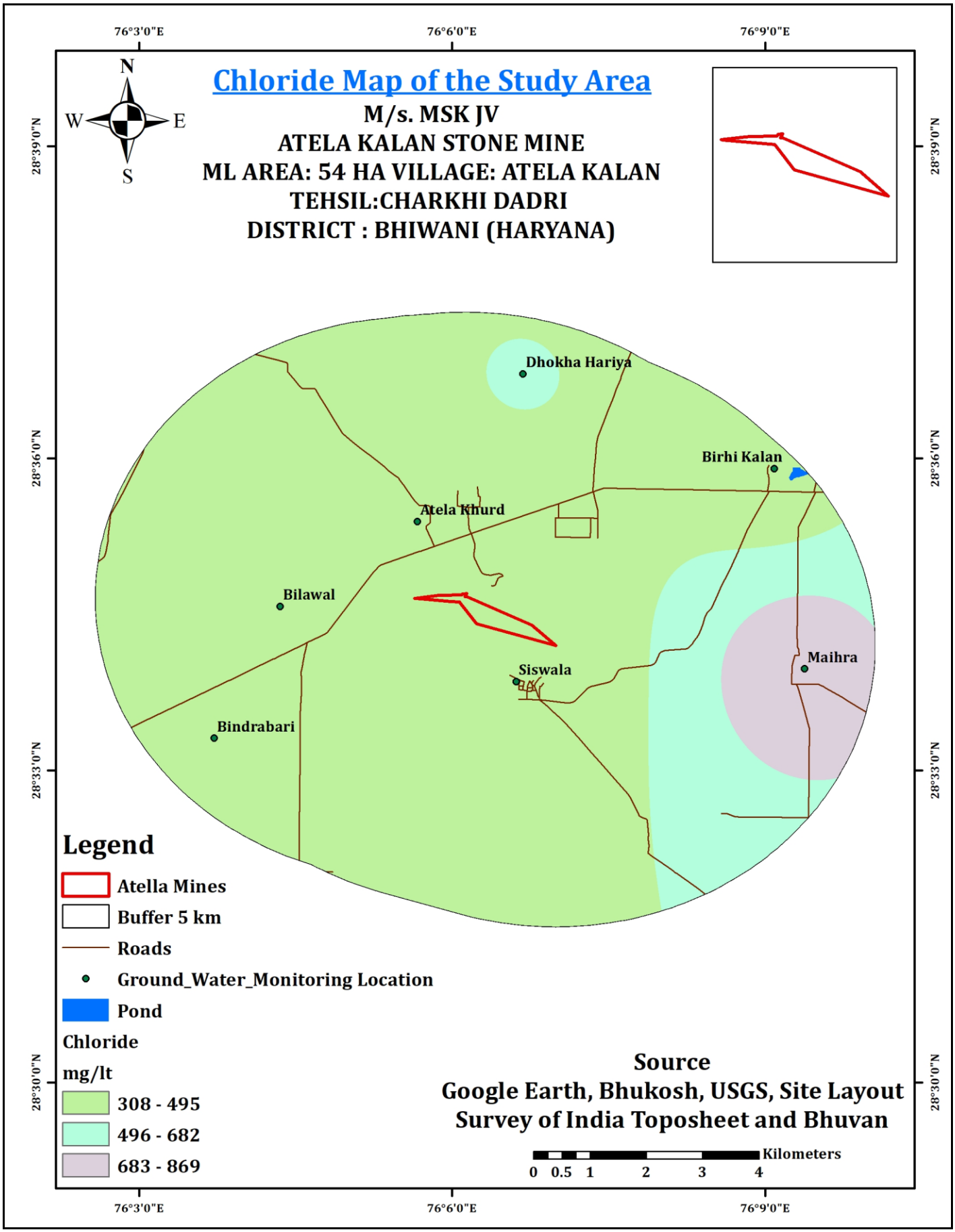


Figure 3.6: Chloride Map (mg/lt) in Buffer Zone Atela Kalan Stone Mine (ML Area: 54 Ha)

(Source: Field Survey)

HYDROGEOLOGICAL STUDY REPORT

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CHAPTER 4

4 GROUND WATER RECHARGE MEASURES AROUND THE MINE

The Ground water assessment studies around 5 km radius zone reveals that the area is safe as per estimation committee norms. The mine area is located in the Safe Taluka. In order to protect the ground water of the study area, artificial recharge measures in and around the Mine has to be taken up. This would ameliorate the ground water levels of the area and also to prevent over exploitation.

Rainwater harvesting/Artificial groundwater recharge is to be done to minimize the undesirable effect on groundwater status. It is necessary that groundwater storage of an area must be arranged by rainwater harvesting so that the existence of any project does not adversely affect the groundwater situation. The artificial recharge to groundwater aims at augmentation of groundwater reservoir by modifying the natural movement of surface water utilizing suitable civil construction techniques. Artificial recharge techniques normally addresses to following issues –

(i) To enhance the sustainable yield in areas where over-development has depleted the aquifer.

(ii) Conservation and storage of excess surface water for future requirements, since these requirements often change within a season or a period.

(iii) To improve the quality of existing groundwater through dilution.

(iv) To remove bacteriological and other impurities from sewage and waste water so that water is suitable for re-use.

The basic purpose of artificial recharge of groundwater is to restore supplies from aquifers depleted due to excessive groundwater development.

FACTORS AFFECTING RUN-OFF POTENTIAL

i. **Climate and Rainfall Pattern**

ii. **Evaporation Losses**

iii. Geological Formation and Catchment Characteristics

AVAILABILITY OF SURPLUS WATER WITHIN MINE LEASE THROUGH PITS

The soil is also generated from joints and cracks due to mining and is being stacked in a temporary stack yard and is being used for plantation simultaneously

PLAN FOR UTILISATION OF SURPLUS WATER

- The water accumulated in the mine pit will be utilized in the development of greenbelt plantation, dust suppression etc.
- The rainwater accumulation will be done in the excavated area in the mining pits.
- There will no less possibility of surface runoff overflowing, but in case of excess rainfall, surface runoff overflow will be managed by garland drains and sedimentation ponds.

For maximum runoff, the maximum rainfall intensity in a day is 100mm as per IMD. Therefore, in order to arrest the runoff generated through rainfall channelized catch drains, Sedimentation ponds and garland drains structures have been proposed. The details of the conservation structures proposed within the study area are as follows:

Table 4.1

Area Breakup of the Project Area

S.No.	Particulars	Area (Sq.m)
1	Rooftop Area	1800
2	Open Area	462700
3	Road Area	16800
4	Green Belt	58700
	Total Area	***540000.00***

Table 4.2

Estimation of Quantum of runoff available within plant premise

S. No.	Particulars	Area (Sq.m)	Rainfall (m)	Runoff coefficient	Quantum of Runoff available (*cum/year*)
1.	Rooftop Area	1800	0.420	0.85	642.6
2.	Open Area	462700	0.420	0.2	38867
3.	Road Area	16800	0.420	0.65	4586.4
4	Green Belt	58700	0.420	0.15	3698.1
Total					***47793.9***

Table 4.3

Hourly runoff (www.imd.gov.in)

S. No	Land use type	Area (Sq.m.)	Hourly Rainfall (m)	Runoff Coefficient (as per CGWB)	Quantity of Rainfall Runoff (cum/hr)
1	Rooftop Area	1800	0.03	0.85	45.9
2	Open Area	462700	0.03	0.2	2776.2
3	Road Area	16800	0.03	0.65	327.6
4	Green Belt	58700	0.03	0.15	264.15
Total					***3413.85***

The firm has proposed to harvest rainwater in underground storage tank and utilize the harvested rainwater in other domestic uses such as flushing.

The water collected from the roof top will be channelized through vertical down pipes and allowed to fall in the underground storage tanks directly for harvesting of rain water.

RECHARGE PIT AND ITS CAPACITTY:

The total hourly runoff is **3413.85** cum/hr. The road-paved area water will be recharged through recharge pits, as per notifications, directions, etc. issued time to time by Water and Pollution Regulatory Authorities, as discussed.

***In order to design the recharge structure, hourly intensity of rainfall is considered to be 30 mm/hr has been taken.**

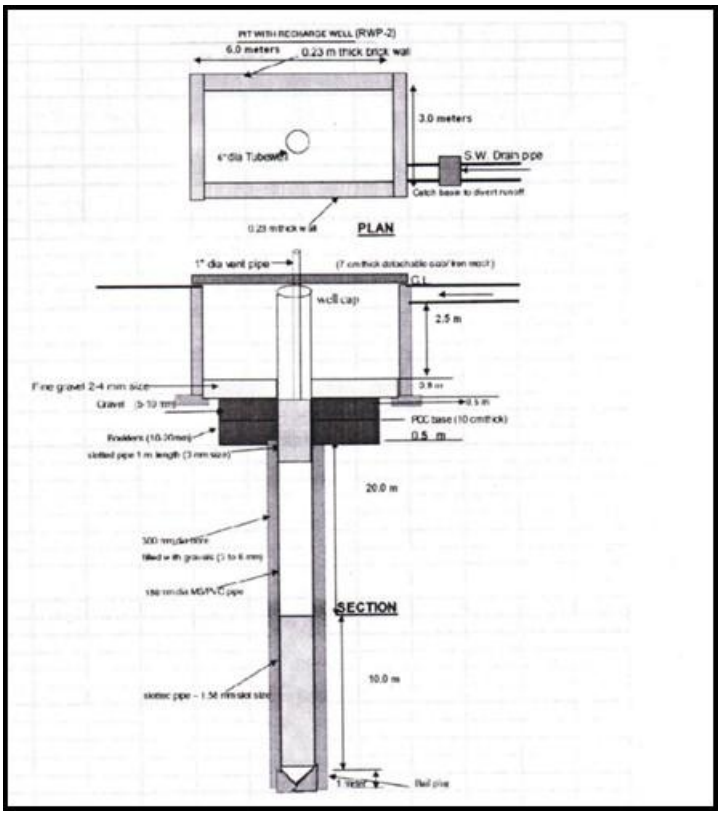

Figure: 4.1: Schematic Diagram of Recharge Pit

Quantum of Rainwater recharge through individual recharge Structure (as shown in figure 4.1):

The total recharge capacity of each structure is given below:

Quantum of Rainwater recharge through individual recharge Structure:

1) Volume of water within free Board (Settlement Chamber)

= 6 m x 5 m x 2.5 m

= 75 m^3

2) Volume of water in Gravel filled Part

i.e. Volume of water within the pore spaces of sand, gravel filled part @35%.

= 6 m x 5 m x 0.5 m x 0.35

= 5.25 m^3

3) Volume of water in Recharge Well through which recharge will be done

Intake capacity of recharge well= 36000 lph = 36 m3/hr.

Therefore, Total volume to be recharge through an individual structure will be

= (75+5.25+36)

= 116.25 m^3/hr

= 3413.85/116.25 = 11 Structure (Tentatively)

The firm has proposed 29 RWH Pit within the project premises. Thus, the rainwater recharging pit can accommodate 116.25 m3/hr of the rainwater

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CHAPTER 5

5 DISCUSSION AND RECOMMENDATION

M/s MSK JV MINING has taken up Atela Stone Mines in Atela Kalan with capacity expansion of mining of Stone along with associated minor minerals from 60,00,000 TPA to 85,00,000 TPA over an area 54.00 ha at village Atela Kalan, Tehsil and district Charkhi Dadri and state Haryana. The mine (54 ha) is an open cast fully mechanized mine of stone granted in favour to M/s. MSK (JV) by bidding process and a mining plan was approved vide letter no. DMG/HY/Atela Kalan/MP/4154 dated 15.09.2014. The lease deed was executed on 13.01.2015.

The ML area is a highly undulated area with rugged topography. The highest point in the lease area is recorded to be 400 mRL and the surface level at 239 mRL, hence height of lease area is 162 m above ground.

Mining lease has been granted in plots due to the Village, roads, nalas and habitation. Appropriate safety barrier will be left. The local drainage pattern in and around the area is sub-parallel and dendritic in nature with low drainage density indicating the formation in the area is comparatively porous and permeable in nature.

The annual average rainfall in the region is around 420 mm (average of last ten years rainfall data from 2015-2024) varying from minimum 320 mm in 2022 to maximum 700 mm in 2024.

Geologically rocks of the allotted area are belonging to Alwar Group. Quartzite is the major litho-unit in the area.

The groundwater in the area occurs under unconfined, semi-confined and confined conditions. In the unconfined state the ground water occurs in the zone of saturation in the pore spaces of granular beds.

In this mining the top level at 401 mRL and surface level at 239 mRL, hence height of lease area is 162 m above ground. The ground water table of the project site ranges from 105-110 bgl (129-134 mRL). The depth on mining at the end of 5th year will be 21 m (218 mRL) and ultimate depth of mining will be 54m (185 mRL) from the surface, hence the water table will not intersect during the entire mine life.

Depth to water level in study area was found to vary between 90 m to 110 m bgl indicating water level to be relatively deep and poor availability of ground water. Though as per HWRA ground water is found to be moderately swallow zones of the perched aquifer condition in which limited access of water is available and its ranges between 50-55 m bgl. The minimum and maximum surface elevation of monitoring points in the study area is found to vary between 226 mRL to 271 mRL respectively. However, in and around mine lease boundary. The pre monsoon water level of the mine site is 110 m bgl whereas the post monsoon water level is 105 m bgl.

Total ground water resource of the buffer zone is 17 mcm/annum while total groundwater draft is 8.82 mcm/annum. The groundwater development in the area is about 52% of total groundwater resources. Therefore, buffer zone is coming under Safe category as per groundwater development status.

In spite of the above clarification the project lies in Charkhi Dadri Assessment Block of Charkhi Dadri District which comes under Safe Category as per CGWB Categorization 2022 as well as HWRA 2022.

HWRA 2022 (https://hwra.org.in/Guidelines.html)

In order to evaluate the aquifer characteristics, constant discharge test has been conducted in the existing bore well for the pumping test purpose. The draw down and recovery have been observed in the pumping well. The draw down and recovery has been measured.

All the mining activity carried out in next five years will not interfere anywhere with the natural drainage pattern. However, to prevent the entry of surface run-off in the active mining pit

Moreover, no stored water shall be released directly to streams. Clean and clear water will be discharged. Check dam will be provided to prevent siltation to discharge. Hence, there is no possibility of any siltation in natural streams and reduction of vertical percolation. It is therefore apparent that there is no significant impact of mining on the surface water regime.

According to groundwater level monitoring data and as per Hydrogeological site visit water level is found deeper in the applied lease area. Depth to water level in and around mine lease area is found to vary between 105m during post monsoon season and 110 m during pre-monsoon season. The mineral availability and depth of mine working will go up to 21m bgl (218m RL) in present plan period and up to 54 m bgl (185 mRL) in conceptual period. Hence, there is no possibility of

groundwater intersection by mine workings, or groundwater seepage in the mine pits either in the plan period or during conceptual period.

The Ground water assessment studies around 5 km radius zone reveals that the area is safe as per estimation committee norms. The mine area is located in the Safe Taluka. In order to protect the ground water of the study area, artificial recharge measures in and around the Mine has to be taken up.

The main purpose of this report is to assess sensitivity of the baseline hydrological environment and the potential impacts of the proposed development upon it and proposes mitigation measures in order to ensure that the potential adverse impacts of the project development on the hydrological environment will be slight and neutral. It contains essential information:

- To assess the risk of water quality impacts from the Project to the groundwater resource.
- Implementation of groundwater monitoring and contingency program is a common requirement of the project
- Information collected in this study was used to determine if the Project is located in a sensitive groundwater area, and to make recommendations

RECOMMENDATION

- The project proponent in consultation with HWRA may provide artificial harvesting structure for better percolation of rain water.
- The design and construction will be done after detailed engineering in case of requirement of harvesting structure development in ponds.
- Methods to prevent or minimize the clogging effect by suspended matter can be classified into following broad groups which the lease area will have to adopt: Periodical desilting, removing of the mud cake and scrapping of the surface layer when dry. This will also kill the algal growth.
- Periodic cleaning of the harvesting structures.
- Cultivation of certain Plant– covers, notably certain kinds of grass
- Reduction of high flow velocities by provisions of perennial vegetation.
- The mine will take up area specific plantation program to enhance the recharge measures.