INTRODUCTORY NOTE

The Lakhpat and Abdasa Taluka of the western part of the Kachchh district of Gujarat, is abundant of limestone over more than 300 km^2area. The Commissioner of Geology & Mining, (CGM) Govt. of Gujarathas been arranged detailed exploration program for cement grade limestone in the limits of Mudhvay village (Mudhvay Block) of Lakhpat Taluka. The detailed& general exploration (G1 & G2) level, at Mudhvay Block was carried out by Gujarat Mineral Development Corporation Ltd. (GMDC) in 2014-2015 by engaging a private drilling agency.

On the basis of the Geological Resource established for cement grade limestone, the Mudhvay Block has been further subdivided into four different sub-blocks, viz. Mudhvay Sub-block A to Mudhvay Sub-block D. All the sub-blocks are adjoins each other.

The CGM issued a notice vide dated 28.03.2017 inviting tender to commence the auction process for grant of mining lease for various Mudhvay Sub-blocks located in District Kachchh of State Gujarat as per the provisions of Mines & Minerals (Development & regulation) Act, 1957 and the Mineral (Auction) Rules, 2015.

The e-auction process was conducted in accordance with the tender document for the said mineral blocks and M/s Adani Cementation Ltd. was declared as the "Preferred Bidder" in respect of 'Mudhvay Sub-block C' under Rule 9(4)(b)(iii) of the Auction Rules. The M/s Adani Cementation Ltd. is a public limited company registered under Company's Act. (**Annexure–I**)

Subsequently the state govt. issued Letter of Intent (LOI) towards grant of mining lease of limestone (cement grade) over Mudhvay Sub-block C (area of 251.90 ha) by Deptt. of Industry & Mines, Govt. of Gujarat vide letter No. MCR-102016-2146-CHH dated 21st June 2017 at various survey no. for a period of 50 years. (**Annexure-I**)

In compliance of the condition stipulated in abovementioned LOI at para 3.3(b),the approval of Mining Plan for opencast method by mechanized means for over251.90 ha area is to beget by Indian Bureau of Mines under rule 16 of MCR'2016.As per condition mentioned under para 3.3(a)(iv) of LOI referring the clause (b) of sub-section (2) of section 5 of MMDR Amendment Act'2015, which says that the mining lease shall be granted after the filing of a mining plan in accordance with the system established by the state govt. for preparation, certification, and monitoring of such plan with the approval of Central Govt.

Subsequent to signing of the Mine Development and Production Agreement upon obtaining all consents, approvals, permits, no-objections and the like as may be required under applicable laws

for commencement of mining operations; mining lease agreement shall be signed between state govt. and the company.

The company is willing to install and commission a cement plant of rated capacity 10mio. TPA of clinker in three phases of 3.3mio.TPA each in the vicinity. Limestone proposed to be produced from this area shall be 12.0 mio. TPA in three phases for cement manufacturing and for trading as well. The mining operations shall be commenced with valid environmental clearance and other clearances from competent authorities.

In the interest of the environment as well as cost effectiveness, the clinkerization unit is to be setup in the vicinity within the range of about 4-5km in the NW direction of the limestone deposit. The transportation of mined limestone is proposed by conveyor belt right from mine pit within mining lease area.

Environmental Clearance for plant has to be obtained by competent authority whose process shall be started probably after approval of mining plan.

There is no eco sensitive zone, i.e. wildlife sanctuary, National Park etc in the core zone. The 3 kms buffer zone of Narayan Sarovar Wildlife Sanctuary is 2 kms to the south of the block.

Differential Global Positioning System (DGPS survey) that provides an improved location (to 10cms accuracy) and altitude data compared to a normal GPS system, by using a network of fixed ground based reference stations to broadcast the difference between the positions indicated by the GPS satellites organized by GMDC Ltd.

Total Station Survey uses a Total Station Theodolite, which is an electronic/ optical instrument using an electronic theodolite integrated with an electronic distance meter to read slope distances from the instrument to a particular point organised by GMDC Ltd.

The Geological and Exploration Report has been prepared by Geovale Services Pvt. Ltd., Kolkata for Commissioner of Geology & Mining (CGM), Govt. of Gujarat ended November 2015. The exploration has been carried out by GMDC Ltd. on behalf of Commissioner of Geology & Mining (CGM), Govt. of Gujarat and data provided to Geovale Services for preparation of exploration report under heading "Geological Report on Limestone Exploration of Mudhvay Sub-block C, Lakhpat Taluka, Kachchh District, Gujarat". Additional information on regional exploration was provided by CGM, Gujarat. The exploration report was submitted to the CGM, Govt. of Gujarat in the month of November'2015. (**Annexure-VII**)

The Mining Plan with Progressive Mine Closure Plan is prepared and submitted under Rule 16 of Minerals (Other than Atomic & Hydrocarbon Energy Minerals) Concession Rules, 2016 and 23 of MCDR, 2017 for first five years from the date of lease execution.

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UNIVERSAL FORMAT FOR MINING PLAN INCLUDING PROGRESSIVE MINE CLOSURE PLAN

MINING PLAN WITH PROGRESSIVE MINE CLOSURE PLAN

1.0 GENERAL

a)	***Name of the Applicant/ lessee***	***M/s ADANI CEMENTATION LTD.***
	Address:	"Adani House", 56, Shrimali Society, Navrangpura Ahmedabad
	District:	Ahmedabad
	State:	Gujarat
	Pin Code:	380 009
	Phone:	+91 90999 91028
	Fax:	+91 79 2555 7585
	e-mail:	bhanu.bhatnagar@adani.com
	Rule 45 IBM Registration Number	Is to be applied
b)	***Status of applicant/ lessee:***	
	(Private individual/ Cooperative Association/ Private Company/ Public Company/ Public Sector Undertaking/ Joint Sector Undertaking)	Public Limited Company registered under the Companies Act, 2013. (**Annexure-II** for **Registration of Company)**
	Name of partner/ Directors with full address	List of Board of Directors of M/s Adani Cementation Limited is enclosed as **Annexure-III.** **Nominated Owner:** Mr. Arvind Pathak (Director)

		Address: Adani Cementation Ltd. Adani House 56, Shrimali Society Navrangpura Ahmedabad – 380 009, Gujarat, India Phone No. Office: +91 79 2555 5555 E-mail: arvind.pathak@adani.com Refer **Annexure-IV** for Resolution passed for appointement for Nominated Owner under Mines Act, 1952 and also refer **Annexure-V** for photo ID and address proof of Nominated Owner.
c)	***Mineral(s) which is/ are included in prospecting license (fresh Grant)***	It is not a case of prospecting license.
d)	***Mineral(s) which is/ are included in Letter of Intent/ lease deed.***	Limestone (cement grade)
e)	***Mineral(s) which the lessee intends to mine***	Limestone
f)	***Name of Person under rule 15 of MCR,2016 preparing Mining Plan***	Rakesh Purohit (Mining Engineer) & S.K. Soni (Mining Geologist)
	Experience of the Personsprepared the mining plan	Rakesh Purohit: - Total experience of 5 year 6 months &21 days from 09.01.1991 to 30.07.1996 in Belka Pahar Calcite & Wollastonite Mine of M/s Wolkem India Ltd. S.K. Soni: - Total experience of 5 year 18 days in Dhanappa Limestone Mine of M/s JK Cement Ltd. from 15.01.2011 to 04.04.2012&in Clay Mine from

		01.06.1988 to 31.03.1992. (**Annexure-VI**)
	Address of person who prepared the mining plan-	Rakesh Purohit 17E/403, C.H.B., Jodhpur – 342 008 (Raj.) Telefax No. (0291) 2706098 Email: rkconsultantsjodhpur@gmail.com S.K. Soni J3C-1, Subhash Colony, Gali No. 4 Defence Lab. Road, Jodhpur (Raj.)-342 011 Mobile No. 099282 - 92928 Email: soni.sarnar.shailendra@gmail.com
	Phone number/mobile number	As mentioned in above cell
	Fax Number	As mentioned in above cell

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2.0 LOCATION AND ACCESSIBILITY

	Lease details	Auctioned ML Area: 251.90ha
a)	***Name of mine/ applied area***	Mudhvay Limestone Area
	Lat/ Long of any boundary pillar	The lat/ long of boundary pillar no. C-01 is furnished below: - 23°43'59.9313" 68°41'51.6687"
	Lease No. & Mine_code	Survey Nos.: various (mentioned below) (**Cadastral Plan** is enclosed as **Annexure-I**) **Mine Code:** not applicable at this point of time.
	Date of grant	It is a case of LOI area
	Period/ expiry date	The period shall be 50 years from the date of lease execution.
	Postal Address:	Village – Mudhvay Taluka – Lakhpat District – Kachchh (Guj.) PIN -- 370601
	Telephone	Not available
	Fax	Not available
	Email ID	bhanu.bhatnagar@adani.com
b)	***Details of applied/ lease area with location plan-***	
	Forest (Specify)- ***Protected-*** ***Notified-***	No forest land involved
	Non Forest ***a) Govt. land*** ***b) Grazing Land*** ***c) Agriculture land*** ***d) Others (santhni land)***	a) 144.40 Ha b) Nil c) Nil d) 107.50ha (42.61%)
	Khasra no./ survey no.	Survey No.: 26P, 26P22, 8P1, 8P2(part), 8P9(part), 18/3(part), 26P10(part), 26P11(part),

		26P18(part), 26P30, 26P33(part), 26P41(part), 26P42, 26P49(part), 26P57, 26P16(part), 27P10(part), 26P8, 26P12, 26P19, 26P25, 26P27, 26P32, 26P47(part), 26P52, 26P63, 26P7, 26P9 & 26P37(part).
	Whether the area falls under Coastal Regulation Zone (CRZ)? if yes, details Thereof	No, the lease area is not found under Coastal Regulatory Zone.
	Existence of public road/railway line, if any nearby and approximate distance-	**Roadways** State Highways and two lane metalled roads connecting the block area with Ahmedabad via Bhuj. The village is located approximately 130 km northwest of Bhuj, the HQ of the Kachchh district. The block area, falling entirely within the Mudhvay village cadastral boundary is located between Lakhpat village to the northeast, Narayan Sarovar to the southwest and about 3 km northwest of S K Varmanagar Village. State Highway 6 connecting Lakhpat and Narayan Sarovar is just at 2 km west of Mudhvay Block. **Railway Station** Nearest railway station is at Bhuj of Western Railway network and is located at a road distance of around 130 km to the southeast of Mudhvay. The rail link is well connected by good quality metalled roads and highways. **Airport** The nearest airport is located at Bhuj and there are commercial flight services between

		Ahmedabad, Mumbai and Bhuj. **Port** Kandla is the nearest seaport located at which is located at a distance of 190km to the southeast of Mudhvay area and around 60 km from Bhuj town, near the city of Gandhidham and on the Gulf of Kachchh. It is the largest port of India by volume of cargo handled and India's busiest major port in recent years. (**Location Plan** enclosed as **Plate No. 1**)
	Topo sheet No. ***with latitude & longitude of all corner boundary point/ pillar***	The area falls in topo sheet no. 41A/10 which has been restricted by competent authority of the area. The extension of LoI area is: - Latitude 23°42'43.65" to 23°44'4.91" & Longitude 68°41'51.66" to 68°42'40.94" The latitude & longitude of entire boundary pillars have been tabulated below.
c)	***Attach a general location map showing area and access routes. It is preferred that the area be marked on a Survey of India topographical map or a cadastral map or forest map as the case may be. However, if none of these are available, the area may be shown on an administrative map.***	**Key Plan** is enclosed as **Plate No. 2.** **Location plan** is enclosed as **Plate No. 1.**

Table 2.1: Detailed land schedule of deposit area

Sr. No.	Village	Survey No.	Area (Ha)
1.	Mudhvay	26 Paiki	144.40
2.	Mudhvay	26 Paiki 22	4.0469
3.	Mudhvay	8 Paiki 1	2.2000
4.	Mudhvay	8 Paiki 2 part	4.8600
5.	Mudhvay	8 Paiki 9 part	2.9400
6.	Mudhvay	18/3 part	3.2400
7.	Mudhvay	26 Paiki 10 part	5.4400
8.	Mudhvay	26 Paiki 11 part	5.6700
9.	Mudhvay	26 Paiki 18 part	3.2400
10.	Mudhvay	26 Paiki 30	4.8600
11.	Mudhvay	26 Paiki 33 part	4.0469
12.	Mudhvay	26 Paiki 41 part	3.2400
13.	Mudhvay	26 Paiki 42	3.2400
14.	Mudhvay	26 Paiki 49 part	3.2400
15.	Mudhvay	26 Paiki 57	3.2400
16.	Mudhvay	26 Paiki 10 part	2.4300
17.	Mudhvay	27 Paiki 10 part	6.4800
18.	Mudhvay	26 Paiki 8	3.1600
19.	Mudhvay	26 Paiki 12	2.4300
20.	Mudhvay	26 Paiki 19	3.2400
21.	Mudhvay	26 Paiki 25	4.8600
22.	Mudhvay	26 Paiki 27	4.0469
23.	Mudhvay	26 Paiki 32	4.0469
24.	Mudhvay	26 Paiki 47 part	4.8600
25.	Mudhvay	26 Paiki 52	3.2400
26.	Mudhvay	26 Paiki 63	4.8600
27.	Mudhvay	26 Paiki 7	2.2400
28.	Mudhvay	26 Paiki 9	4.8600
29	Mudhvay	26 Paiki 37 part	3.2400

		Total	**251.9000**

Table 2.2: Co-ordinates of extremities of entire auctioned area Boundary Pillars by DGPS

Name of pillar	Latitude	Longitude
C-01	23°43'59.9313"	68°41'51.6687"
C-02	23°44'04.9094"	68°42'08.9220"
C-03	23°43'51.1884"	68°42'21.6750"
C-04	23°43'31.6664"	68°42'28.3460"
C-05	23°43'14.2794"	68°42'39.6360"
C-06	23°42'52.4463"	68°42'40.9420"
C-07	23°42'43.6432"	68°41'53.2506"

Table 2.3: Co-ordinates of extremities of entire Boundary Pillars by GPS

Name of pillar	Latitude	Longitude
C-01	23°43'59.93"	68°41'51.66"
C-02	23°44'04.91"	68°42'08.92"
C-03	23°43'51.18"	68°42'21.67"
C-04	23°43'31.68"	68°42'28.35"
C-05	23°43'14.27"	68°42'39.62"
C-06	23°42'52.46"	68°42'40.94"
C-07	23°42'43.65"	68°41'53.25"

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3.0 DETAILS OF APPROVED MINING PLAN & MODIFIED MINING PLAN

<table>
<tr><td>3.1</td><td colspan="4">Date and reference of earlier approved MP/ SOM</td></tr>
<tr><td>S.N.</td><td>Type of document & rule under which prepared</td><td>Approval letter no. & date</td><td>Lease area for which approval given (ha)</td><td>Proposal from – to</td></tr>
<tr><td></td><td colspan="4">Not applicable as it is a case of fresh grant.</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.2</td><td colspan="4">Details of last modifications if any (for approved MP/ SOM, indicating date of approval, reason for modification the previous approved period) of</td></tr>
<tr><td></td><td colspan="4">Not applicable as it is a case of fresh grant.</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td>3.3</td><td colspan="4">REVIEW OF EARLIER APPROVED PROPSAL-
(Exploration, Development & Reclamation etc.)</td></tr>
<tr><td></td><td colspan="2">Items</td><td>Proposals</td><td>Actual work done</td><td>Remarks</td></tr>
<tr><td></td><td colspan="5">Not applicable as it is a case of fresh grant.</td></tr>
<tr><td>3.4</td><td colspan="4">Give status of compliance of violations pointed out by IBM</td></tr>
<tr><td></td><td colspan="4"><table><tr><td>Sr. No.</td><td>Date of inspection</td><td>Violation date</td><td>Rule violated</td><td>Compliance status</td></tr><tr><td></td><td colspan="4">Not applicable as it is a case of fresh grant.</td></tr><tr><td colspan="5"></td></tr></table></td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td>3.5</td><td colspan="2">Indicate and give details of any suspension/ closure/ prohibitory order issued by any Government agency under any rule or Court of law.</td><td colspan="2">Not applicable as it is a case of fresh grant.</td></tr>
<tr><td></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>3.6</td><td colspan="2">In case the MP/ SOM is</td><td colspan="2">This mining plan is being submitted under Rule 16 of</td></tr>
</table>

	submitted under rules of the MCDR'17 or under rule 17 of the MCR'2016 for approval of modification, specify reason and justification for modification under these rules.	MCR, 2016.

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PART – A

1.0 GEOLOGY AND EXPLORATION

(a)	***Briefly describe the topography, drainage pattern, vegetation, climate and rainfall data of the area applied/mining lease area.***
	Mudhvay Sub-block C is part of the Mudhvay Block in the Lakhpat Taluka in the Kachchh District of Gujarat. It is N-S elongated irregular polygonal block with an area of 2.519km^2 (251.90ha) having dimensions of approx. 2.4km in length and 1.3km in width. The block has a relief of 15 m, with altitude ranging from 22 m AMSL to 37 m AMSL. The topography is gently rolling and a thin 1 – 3 m veneer of red brown soil overlie the Maniyara Fort Formation in most part of the Sub-block C. The block is located about 6 kms from the Kori Creek, which forms an estuarine inlet to the Arabian Sea, further south. The 3 kms buffer zone of Narayan Sarovar Wildlife Sanctuary is 2 kms to the south of the block. GMDC organized the topographic survey using Total Station Theodolites and DGPS surveys to determine the boundary of the block and classified the block area as Government and Santhani Land. The major morphological features include undulating and flat land. The gently sloping areas towards NW and north. Part of the area is under cultivation whereas remaining areas is practically barren. There is no regular drainage pattern in this area. Rainwater follows as per surface topography. The availability of soil cover is all over the area. The natural vegetation was practically lacking. In the core area, the natural flora is represented only by occasional cactuses or small bushes of wild nature over the waste land. The auctioned mining lease area fall in the semi-arid zone with extremities of cold and hot can be feel. The area does not possess any piece of irrigated land. Cropping is absolutely dependent on the rainfall. Seeds are sown after the first rainfall, but if there is no sustained rainfall, even this is lost. When there is sustain rainfall, Jawar, Bajri and Moong crops are grown without any regular pattern. Mudhvay village (falling outside the Mudhvay Sub-block C) is the nearest village, at about

1.5 to 2 kms from the middle of the Sub-block C. No legal habitation is known to exist within the Mudhvay Sub-block C. Mudhvay village (outside the bounds of Sub-block) is a small (low population) village located in the Lakhpat of Kachchh district, Gujarat with total 103 families residing. The Mudhvay village has population of 503 of which 265 are males while 238 are females as per Population Census 2011.

Climate

The climate of the Kutch district is semiarid with scanty rainfall and moderate humidity. The coldest month is January and the hottest month is May.

Rainfall

The average annual rainfall is reported as 343 mm, and most of this is received in the months of June and Sept. The variation in the rainfall from year to year is large.

Temperature

Summer season: Temperatures range from a minimum of 22°C and it is known to have gone up to levels of around the 40°C mark.

Winter season: The winter season is from November to March and temperatures range from a minimum of 8°C to a maximum of 35°C.

Humidity

The relative humidity is high during the southwest monsoon, being generally over 80%. After the monsoon season, humidity decreases, and during the winter season, the air is fairly dry. However, the relative humidity remains above 50% from March to October.

Wind Direction

An observation of the evening wind-rose shows that the predominant wind direction is from SW almost throughout the year excluding in the months of November, December and January, when the predominance is from NE. The morning winds are from SW during the period from April to September while it is from NE during November to February. March and October being the changeover months from one direction to

diagonally opposite direction. The general wind speed exceeds during the months of May to August.

Wind speed

Wind speed plays a dominant role in the dispersion of air pollutants. The wind speeds were found in the range between 0.5 and 36.3 Km/Hr, with the average value of 11.42 km/hr. Winds were found usually high.

Forest

There is no forest in the core zone.

Wild life sanctuary/ National park etc.

There is no wildlife sanctuary, National Park etc in the core zone. The 3 kms buffer zone of Narayan Sarovar Wildlife Sanctuary is 2 kms to the south of the block.

Flora

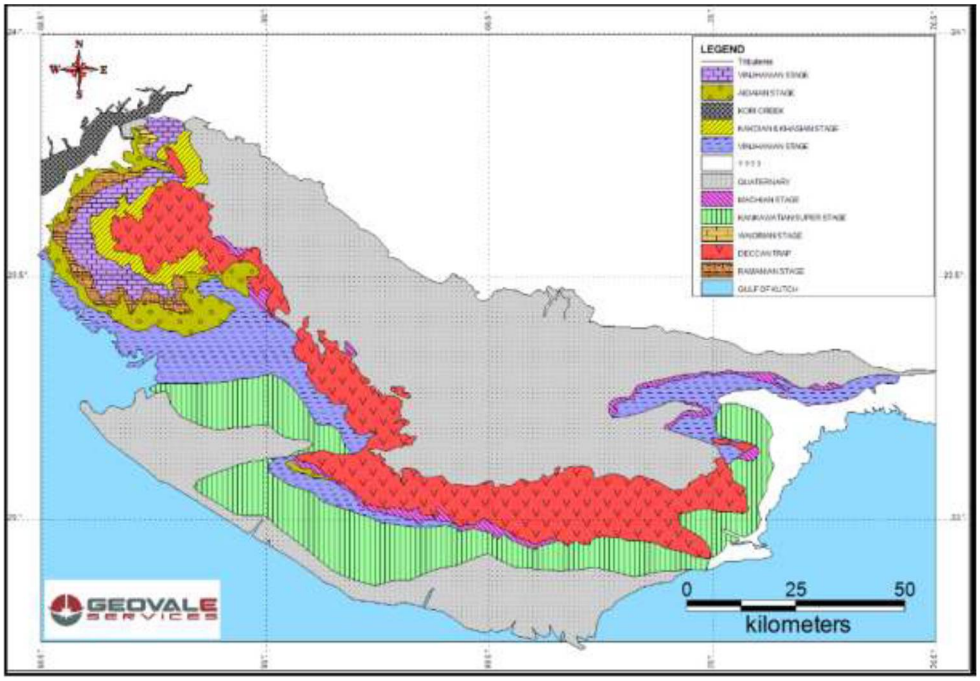
The auctioned area is scanty/sparse vegetation. The natural floral species found in the whole of the study area are representative of the Rann Saline tropical Thorn Forest. The types of plants/ trees found in the study area are as follows: -

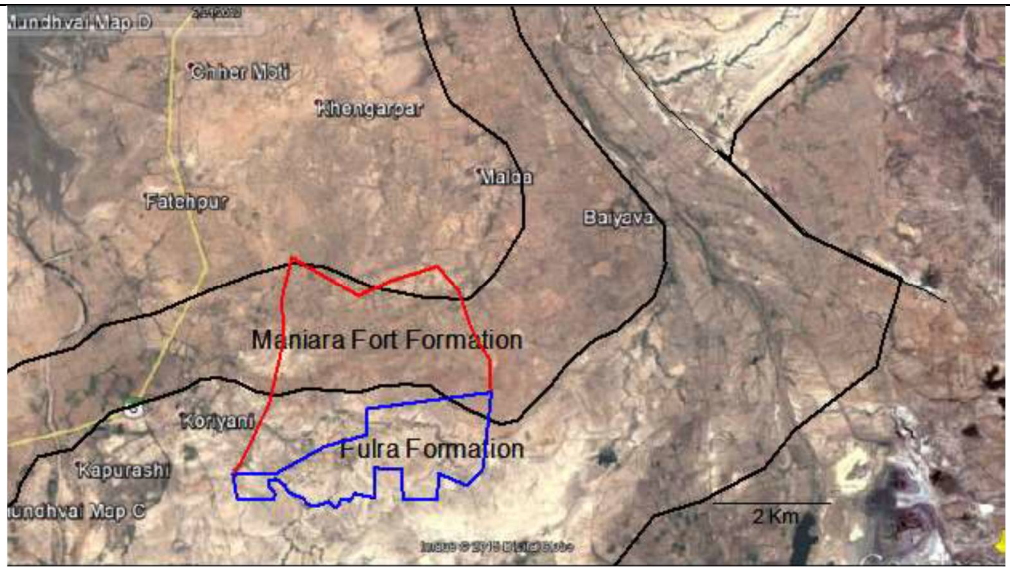
Ganda Baval, Aval, Baval, Gorad, Limdo, Ron, Madith, Miti Jar, Khari Jar, Tal bavdi, Vad, Saru, Pipalo, Khijdo, Gundi, Ambli, Guggul, Kanthoro thor, Akado, Moto akado, Kumari, Cheni bor, Bordi, Kanthar, Kerdo, Karamdi, Kathgundi, Rambaval, Khipp, Bekara, Undhanphuli, Jinjru, Kulnnphul, Bhiya Ringani, Darudi, Moti Bhonpatri, Ratoliya, Ekalkanto, Patharphod, Baru, Darbha, Dab Saliu, Daro, Gandharu, Lampdu.

The average density of trees in the area excluding grass and bushes is hardly 5-6 per hectare.

Fauna

No wildlife of any sort is found within the area during site visit. The study area being

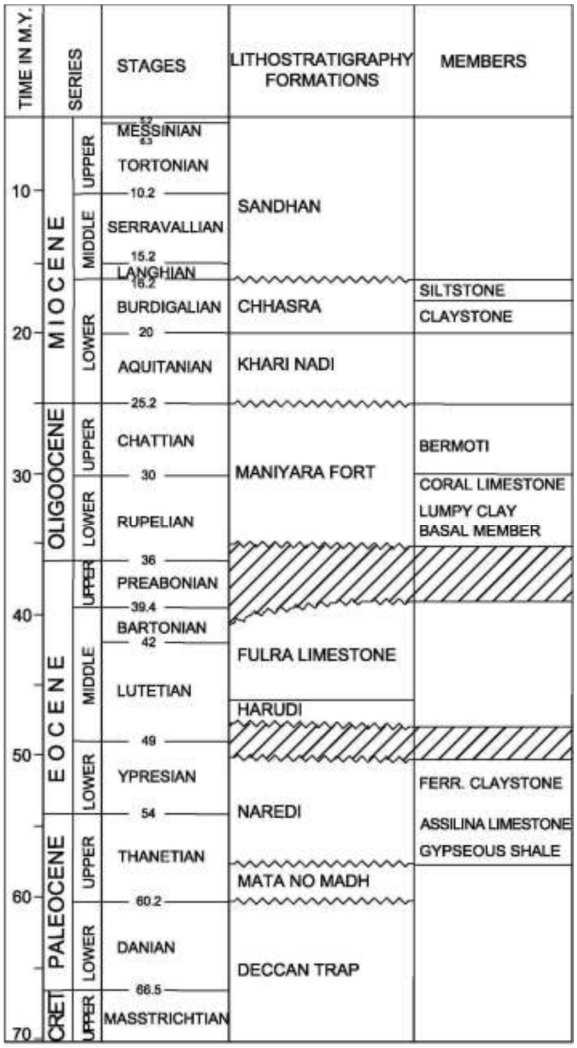
	almost barren and devoid of water bodies resulting in patter of animal distribution not in abundance. The Nilgai or Blue Bull, Indian Fox, Indian Hare (Black naped hare), Striped Hyena, Jackal are the mammals observed.
(b)	***Brief descriptions of Regional Geology with reference to location of lease/ applied area.***
	Limestone deposits of Kachchh are part of the southerly arcuate Kachchh basin. The outcrops of these deposits (**Figure:1** below) along the southern and western coastline are determinable from the Landsat satellite image (**Figure:2** below). The limestone bearing belt extends from Lakhpat in the north to Bhadramota in the southeast. **Figure:1, shows Geology of Kachchh district, published by the Geological Survey of India**  **Figure:2: The map above shows Fulra and Maniyara Fort Formation contact outlines drawn over the space imagery (from Google Earth). Mudhvay Block is also shown. The polygon shown in blue is the 3 km forest buffer for Narayan Sarovar Sanctuary.**



Kachchh Basin (**Figure:1**) evolved after the separation of Indian Plate from Gondwanaland during the early Mesozoic Era. However, the outcropping limestone formations of interests in the basin were deposited in the early part of Tertiary Period, after the collision of the Indian Plate with the Asian Plate and eruption of Deccan Basalt Volcanism.

Geological Survey of India has carried out the systematic geological mapping of the Kachchh basin (Vijaysarathi, 1983, 1984). However, in two pioneering papers, S.K.Biswas (1992 and 2005) has provided the Tertiary stratigraphy of Kachchh and Tectonic Set Up of Kachchh. Kachchh Basin was formed as a pericratonic rift basin after separation of Indian Plate and reactivation of primordial faults extending from the Precambrian Aravalli Fold Belt. The Tertiary stratigraphy in Kachchh, indicating the sequence of deposition of rocks in the Kachchh Basin has been adopted from Biswas (ibid) work and is given below (**Table below**).

Table A1.1: Regional Lithological Sequence



The regional geology is provided in the detailed Geological Map of Kachchh Basin (**Figure:1**). Successive Tertiary rock formations, named as Mata no Madh Formation, Kakadi Nadi Formation, Harudi Formation, Fulra Formation, Maniyara Fort Formation, Khari Nadi Formation, Vinjhan Formation and Sandhan Formation successively overlie the Deccan Trap Formation as the basement. The thickness of the total Tertiary sedimentary package, above Deccan Trap is ~ 300m.

The sedimentary rocks show a regular convex disposition along the western and southern coastline. The rocks show low angle (3-7°) qua-quaversal outward dips.

There are three sets of major (normal) basinal faults, which trend NW-SE, NE-SW and E-W. Sedimentary units invariably show a thickening near the basinal faults.

	Cumulative limestone thickness vary from 25 m away from the faults to more than 75m near the faults in the NW, W and southern part of the Kachchh Basin. The two successive predominantly limestone bearing formations, viz. the Fulra Formation of Eocene Oligocene Epoch, which overlies the Harudi Formation, and Maniyara Fort Formation of Oligocene - Miocene Epoch, which overlies the Fulra Formation, are of commercial interest. The total thickness of these two formations may range upto 80m or more. Both the formations have limestone units intercalating with shale, clays and occasional sandstones. Gujarat Mineral Research and Development Society (GMRDS), under the aegis of Commissioner of Geology and Mining, Gujarat have explored the 350 km^2 belt of Fulra and Maniyara Fort (limestone) Formation and underlying rocks to assess commercial usability. Mudhvay Block was selected for detailed/ general exploration. **Regional Mineralisation** Information used for description of regional limestone mineralisation has been primarily sourced from Ghevaria's (2009) report on regional exploration, carried out by GMRDS (CGM, Gujarat). Public domain information and information from Geovale's site visit have supplemented the information described below. The regional extent of high interest successive Fulra Formation and overlying Maniyara Fort Formation is shown in the regional geological map above (**Figure:1**). Both the formations have cement grade limestone, as established by GMRD Study. The Fulra Formation is a white to greenish white to brown in colour, generallyfriable aggregate of nummulitic and occasionally coralline limestone. The limestone is intercalated with multiple sequences of marl, shale and siltstone. About 8 to 10such bedded sequences of shale and siltstones alternating with carbonate (limestone and marl) are seen within a cumulative thickness of 30 m. Limestone thickens to over 50 m in some parts of the basin. The shale and marl being minor to limestone occur as lensoid patches or interfingering patches of 1 to 2.5 m band thickness, as interpreted from borehole sections. Fulra Formation has a sandy and argillaceous unit at the base. Marl and shale show finely horizontally laminated, rythmically deposited carbonates and argillaceous matter. The numulitic limestone is composed of micrites and pellets of calcareous matter, detrital calcite, bio-micrite and fossil shell debris set in a calcareous and clayey cement.

	Maniyara Fort Formation un-conformably overlies the Fulra Formation. The former is a bedded sequence of limestone with marl and glauconitic clay. Like Fulra Formation, the Maniyara Fort Formation too consists of nummulitic and coralline fossils. The rock is yellow brown to buff while in colour, hard and compact and lumpy in nature. The numulitic fossil shells show size gradation vertically, with larger and coarser fractions accumulated at base and gradually reducing size towards the top. The top most units are cyclically deposited limestone unit comprising hard and compact and extremely fine grained limestone with no major fossils. Cement grade nature of limestone: GMRDS (2009) report described the nature of limestone w.r.t. its cement grade quality. The numulitic fossiliferous limestone have CaO% varying between 45 – 53% both the Fulra and Maniyara Fort Formation. The shaley and clayey horizons, the CaO content vary between 15 – 32% and in marly horizons between 32 – 45%. The specific gravity varies between 2.28 to 3 for limestone.
(c)	***Detailed description of geology of the lease area such as shape and size of the mineral/ ore deposit, disposition various litho-units indicating structural features if any etc.*** **(Applicable for Mining Plan for grant & renewal and not for Scheme of mining/ Modifications in the approved mining plan/scheme of Mining)**
	Geology of Mudhvay Sub-block C Mudhvay Block was identified for detailed exploration based on the RRAS study by GMRDS. The geological map of Mudhvay Block is shown in the map below. Fulra Formation outcrops in the southern half of Mudhvay Sub-block C and Maniyara Fort Formation sub-crops or outcrops in the northern half the sub-block. Fulra (limestone) Formation forms grey white soil. Maniyara Formation forms yellow brown soil cover. The contact between Fulra and Maniyara Formation is sharp and identifiable in Landsat 7-4-2 (RGB) images (**Figure:3**). Mudhvay Sub-block C is shown in the in the Geological Map, Plate No. 4. While only Fulra and Maniyara Fort Formation are sub-cropping at the surface, the exploration diamond core drill-holes have intersected through the entire section of Maniyara Fort Formation and the Fulra Formation into the Harudi Formation at the base. Few drill-holes have further intersected down to Mata no Madh and Deccan Traps as well.

Figure:3: Generalised litho-stratigraphic succession of the Mudhvay Block

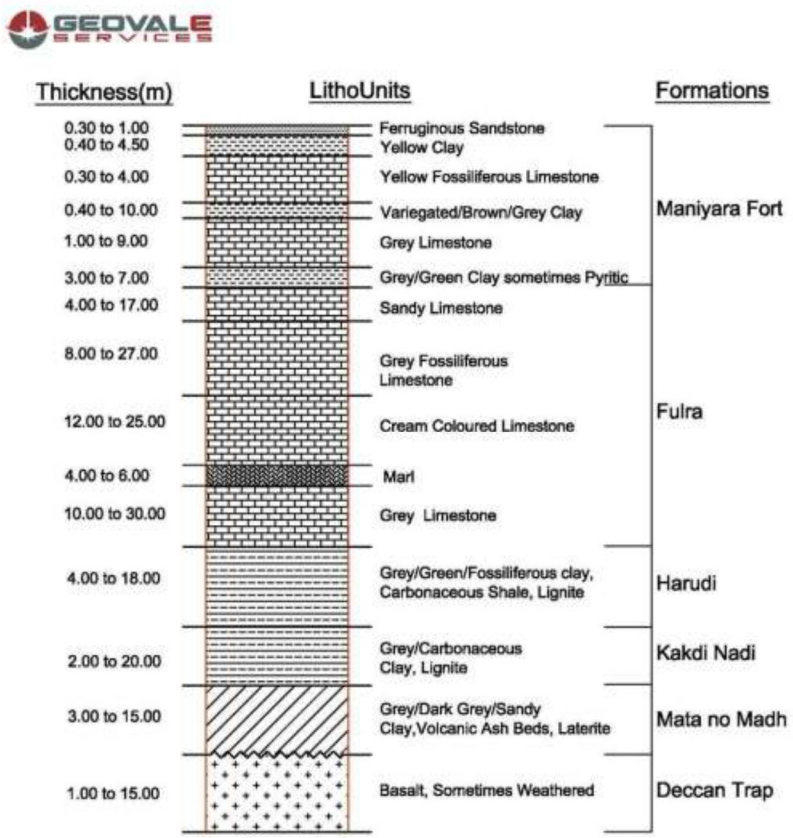
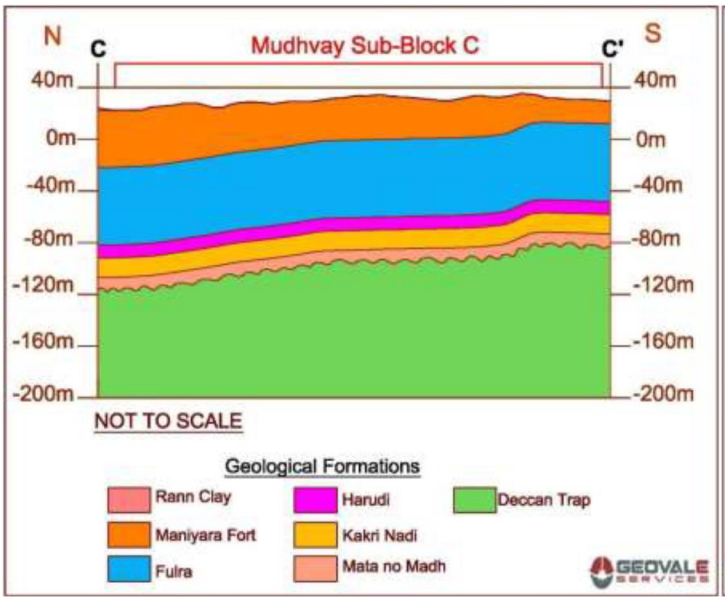


Figure:4: Schematic Cross Section across Mudhvay Sub-block C



The schematic N-S cross section across Mudhvay Sub-block C shows conformable relationship of all the Tertiary formations above Deccan Trap. Blue represents Fulra

Formation, underlying the Maniyara Formation (red).

Lithological Description of Mudhvay Sub-block C

Deccan Trap

Basalt has been intersected in drill-holes KLM-058 and KLM-062 and KLM-320. These rocks are greenish grey aphaneric hard compact rocks, with occasional vesicle fills. These rocks as fine to very fine grained, hemi-crystalline, often porphyritic and show intergranular to sub-ophitic textures.

Mata No Madh Formation

Lithologies have been intersected only in drill-hole KLM-058 and KLM-320. Mata no Madh Formation has been intersected only in drillhole sand consists of leached Deccan Trap basalt, including lithomargic clays and laterites. The clays occur as structureless massive clays.

Kakdi Nadi Formation

Lithologies have been intersected only in drill-hole KLM-058.KakriNadi Formation as intersected in the drill-holes is a sequence of variegated and gypsiferous clays, marl, and carbonaceous shale.

Harudi Formation

Lithologies have been intersected in all drill-holes except KLM-066 and KLM-067 located at Sub-block C. Harudi Formation invariably forms the base of Fulra limestone Formation; both have been intersected in almost all the drillholes. The Harudi Formation consists of grey and yellow coloured gypsiferous shale, grey coloured shale and ferruginous sandstone.

Fulra Formation

Lithologies have been intersected in all the boreholes located at Sub-block C. The Nummulitic limestone forms a distinctive bad land topography and is decipherable in the Landsat 742 (as RGB) processed images (**Figure:2**) as white tonal feature. In the upper part of the formation, the landscape underlain by limestone consists of alternating small rolling mounds with exposed 2 to 4 m high cliff sections. The rolling mounds are covered by reddish ferruginous compact sandstone cappings. Stream sections cut through the limestone and expose the rocks in 3 to 5 m high cliffs along the banks.

Fulra Formation is the primary ore horizon in the Block. The formation starts conformably above the inter-banded clay, limestone bands of Harudi Formation, with a

persistent thin (2-3m thick) marl horizon. The marl is overlain by alternating bands of massive grey white numulitic limestone, alternating with massive cream coloured limestone.

The Fulra limestone (**Figure:5**) is an accumulation of shells of Nummulites on the basin floor. The marly unit at the base shows finely laminated rhythmically deposited calcitic matter. The numulitic limestone appears to be debris of Nummulites set in a matrix of calcareous micrite and sparite. In thin sections (studied by GMRDS) limestone contain clastic calcite, micrite and pellets of calcareous matter, detrital calcite, biomicrite and fossil shell debris set in acalcareous and clayey cement.

Figure:5: Different limestone types in the Mudhvay Block. The left shows the yellow numulitic limestone of Maniyara Fort Formation, which occur as relatively thinner bands. The picture in the right shows grey numulitic limestone of Fulra Formation, which occur as thick continuous bed.

Maniyara Fort Formation

Lithology have been intersected mostly in the northern half of Mundhvay block and as thin layers at few places in the sourthern half. This formation has been intersected in all boreholes drilled at Sub-block C.

Maniyara Fort Formation overlies the Fulra Formation conformably as a sequence of inter-banded fossiliferous limestone, clay, shale and sandy limestone. The limestone is buff to white coloured compact, lumpy limestone containing fossils of larger Nummulites (than in Fulra Formation) and coralline limestone. The cumulative thickness of the formation varies from few metres to more than 70 m as intersected in the drillholes of Mudhvay Block.

As described by GMRDC, the fossiliferous nummulitic and coralline limestone of

Maniyara Fort Formation is yellowish brown to buff white is colour, hard and compact and lumpy in nature. It contains calcite, aragonite, detrital quartz, micrite and sparite set in a calcareous cementing material. The nummulitic limestone shows a clastic texture with micrite cement. The sparites range from 10 - 20%, micrite from 20 - 25% and fossils from 50 - 60%. In case of coralline limestone, the rock shows clastic texture comprising of micrite (20 - 25%), fossil (60 - 65%), sparite (10-15%). In the case of marl, the marl is golden yellow in colur, comparatively soft and friable in nature and contains calcite and aragonite as clastic with clacarious and clayey cementing material. It shows clastic texture with micritic material containing about 30 - 35% of fossil content and 60 - 65% of matrix.

Block Structure

The surface geological mapping of the block, carried out by Geological Survey of India (Vijaysarathi, 1983, 1984) indicates that the rocks strike NE-SW and dip 3 to 5 towards NW.

Primary structure in the rocks is bedding, which can be easily identified as compositional and coloured layering. Larger foraminifers show and imbrications along the bedding. The beds are flat lying to shallow dipping (3 to 7) towards NW.

Other primary structures include current bedding in some of the sandstone layers and glauconitic clay, some dessication structures associated with limestone, burrow marks in gypsiferous clays and penecontemporaneous cut and fill structures Mudhvay Block forms part of the western limb of a broad open, shallow northerly plunging antiform, as deciphered from GSI's systematic geological mapping program at1:50,000 scale.

No major fault has been noticed or interpreted from the drill-hole data in the Mudhvay Block. However, Mudhvay Block occurs immediately to the south of Akrimota - Fulra - Malda fault, clearly visible in the satellite image of the region, and mapped by Geological Survey of India (Vijayasagar, 1983, ibid)

Block Mineralisation

Mudhvay Block has been explored for cement grade limestone. The drill core sample (**Figure:6**) assays indicate that Fulra Formation and overlying Maniyara Fort Formation consist of cement grade limestone lithounits. Fulra Formation (**Figure:5**) is the main ore bearing horizon in the Mudhvay Block. Fulra limestone consists of successive bands of massively bedded numulitic limestone, with occasional marly bands. The cumulative

thickness of limestone in the Fulra Formation goes above 60m. The intersected thickness of Fulra limestone in drill-holes range from 30 – 40 m in the south to upto 60 m in the north. The limestone and inter-bands of marls are correlatable across strike. Assays of limestone are consistent within specific range of grades, in the bands. The limestone assays range to 52% CaO, with an average grade of ~ 43% CaO. The chemical grade range of Fulra limestone is given in **table A1.2**. In the northern half of Mudhvay Block, Fulra limestone is overlain by Maniyara Fort Formation. The Maniyara Fort Formation consists of 2 to 4 bands of numulitic limestone and marl inter-banded with clay and shale formations. The limestone bands range in thickness from ~1 to ~5m.

Figure:6: Picture above shows diamond core drill-cuttings of soft limestone of Fulra Formation. The limestone drillcores have been split using a traditional core splitter, half core preserved and the other half sent for assay.

Table A1.2: Basic Statistics of chemical constituents of Mudhvay Deposit

Parameters	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	P_2O_5	Na_2O	K_2O	SO_3	LOI
Mean	8.73	3.50	2.16	43.11	2.56	0.05	0.47	0.22	0.76	37.52
Standard Error	0.08	0.03	0.03	0.10	0.03	0.00	0.01	0.00	0.01	0.06
Median	7.81	3.03	1.73	44.31	2.12	0.06	0.29	0.20	0.53	38.20
Mode	3.90	3.12	0.80	48.14	2.16	0.00	0.14	0.34	0.00	38.00
Standard Deviation	4.92	1.93	1.66	5.74	1.49	0.04	0.64	0.12	0.73	3.20
Sample Variance	24.16	3.74	2.74	32.92	2.23	0.00	0.41	0.02	0.54	10.24
Kurtosis	35.99	5.32	32.14	7.25	2.58	41.48	98.85	80.98	1.95	16.83
Skewness	4.08	1.74	3.79	-1.79	1.41	2.52	8.48	5.76	1.52	-2.78
Range	72.29	18.95	24.85	51.99	11.14	0.72	10.88	2.72	4.07	34.20
Minimum	1.76	0.52	0.31	1.01	0.19	-0.01	0.08	-0.17	-0.06	8.17
Maximum	74.05	19.47	25.16	53.00	11.33	0.71	10.96	2.55	4.01	42.37
Sum	29223.48	11704.21	7214.69	144296.53	8558.29	173.34	1573.87	746.65	2548.78	125586.04
Count	3347.00	3347.00	3347.00	3347.00	3347.00	3347.00	3347.00	3347.00	3347.00	3347.00

By pursuing core logs, as the litho encountered in core boreholes based upon running strata at about 1m to 2m interval in case of limestone. Whereas soil and sandy soil is concerned, the thickness shown is the cumulative thickness encountered in borehole. In the clay matrix, 1m to 2m interval lithological description is furnished. In such, preparation of geological sections based on running geological data is complicated to

understand and to prepare also. On the other hand, utilization of limestone is based on % of CaO contents. Therefore, the geological name of the single litho or group of lithos have been replaced with new nomenclature as mentioned below: -

S. No.	**Litho units in core logs**	**Name assigned to litho as per utilization**	**Remark**
1.	Soil	Soil	No change
2.	Sandy soil	Sandy soil	No change
3.	Grey clay, yellow clay, Brownish clay, dark grey clay, Fossiliferous grey clay, sandy clay, compact grey clay, sandy grey clay, variegated clay, carbonaceous clay etc.	Waste (Mixed Clay)	To avoid complicacy
4.	Sandy limestone, grey clayey limestone, marlite, grey fossiliferous limestone	Low Grade Limestone	CaO varies between 33% to 40%
5.	Sandy limestone, marlite, grey clayey limestone,	Cement Grade Limestone	CaO varies between40% to 45%
6.	Cream colored limestone	High Grade Limestone	CaO having +45%

The name changes have been taken place in order to make the sections understandable and mine planning too.

Low Grade Limestone:

The range (in terms of CaO) of this category of limestone has been kept vide from 34% to 40% looking towards threshold value issued by IBM for State Gujarat. It is anticipated that about 23% or more of the low grade limestone material may be utilized and rest shall be treated as waste/ sub-grade mineral probable below CaO 37% on color basis in this case.

Cement Grade Limestone:

The range (in terms of CaO) of this category of limestone has been kept from 40% to

	45%. It is anticipated that about 100% of this grade limestone material may be utilized. High Grade Limestone: The range (in terms of CaO) of this category of limestone has been kept from +45%. It is anticipated that about 100% of this grade limestone material may be utilized.
(d)	***(i) Name of prospecting/ exploration agency: -***
	Exploration Agency: M/s Gujarat Mineral Development Corp. Ltd. (A Govt. of Gujarat Undertaking) Drilling Agency: M/s Khanna Associates Geological Report Compilation Agency: M/s Geovale Services Pvt. Ltd.
	(ii) Address Exploration Agency GMDC Ltd. Corporate Office: Khanij Bhavan, 132 Ft. Ring Road, Nr. University Ground, Vastrapur Ahmedabad- 380 052, Gujarat Drilling Agency: M/s Khanna Associates B-42/18, Ramesh Nagar, Nr. Govt. Girl School, Delhi - 110015 Geological Report Compilation Agency: M/s Geovale Services Pvt. Ltd. 56, Ideal Villas, Kochpukur, Rajarhat Kolkata – 700 156, West Bengal
	(iii) Email add. & phone no. Exploration Agency: GMDC Ltd. Ph. No. 079 2791 3200, 2791 3501 Fax No. 079 2791 3038, 2791 1454 Email: contact@gmdcltd.com

	Drilling Agency: Khanna Associates Ph. No. 01125411857 Fax No. 01165372624 Geological Report Compilation Agency: Geovale Services Pvt. Ltd. Ph. No. +91 98308 80688 Fax No. +91-33-66376666
(e)	***Details of prospecting/exploration already carried out:***
	Historical Exploration The British Geological Survey of India mapped and established the Tertiary Geology of Kachchh. There have been significant studies both during pre-independence and post - independence times to develop an understanding of the Tertiary litho- and bio-stratigraphy. Biswas (1992) of ONGC gave the litho/ chronostratigraphic classification of the Tertiary rocks which are currently being followed. Geological Survey of India carried out 1:50,000 scale geological mapping of the region (Vijasarathi, 1983, 1984). Gujarat Mineral Research and Development Society (GMRDS), under the aegis of Commissioner of Geology and Mining, Govt. of Gujarat have explored regionally the belt of Fulra and Maniyara Fort (limestone) Formation and underlying rocks. Mudhvay Block was selected for detailed exploration. **Exploration Process** 12.89 km^2 of Mudhvay Limestone Block was identified for detailed and general exploration by CGM following the Rapid Reserve Assessment Surveys (RRAS) of Tertiary limestone deposits along the western arcuate margin of Kachchh Peninsula in 2009. GMDC was engaged to carry out the detailed/ general exploration for the block. GMDC"s exploration team carried out diamond core drilling (Figure:7), drill-core logging, sampling, organized assays and site database management. GMDC provided all the data sets to Geovale Services to carry out Geological Resource estimation and write the Geological Exploration Report. Geovale set a team to carry out rapid site due diligence, QA-QC of the data provided, assess Geological Resource and write the Geological Exploration Report for the project.

Figure:7: Voltas make, tripod mounted Drill Rigs have been used for Mudhvay Exploration

Exploration Team

The team consisted of one project geologist from GMDC to supervise the exploration activities and the drilling contractor provided three exploration geologists, one drilling supervisor, one site in-charge and the drilling crew.

Laboratory Details

The samples were assayed at the Inspectorate Griffith‟s (IG) Laboratory at Gandhidam. Limited number of samples was sent to IG‟s laboratory at Bhubaneshwar. Inspectorate Griffith‟s (IG) Laboratory is NABL approved laboratory and having branches across the nation.

Drilling Contractor & Drill Rig

Khanna Associates, Delhi was engaged to carry out diamond core drilling(**Figure:7**) at Mudhvay Limestone block. Voltas 650, 320 and 120 drill rigs were used for this project.

Standard Operating Procedure and Drilling Strategy

- Borehole numbers were allocated by GMDC geologist
- Drilling was carried out from east to west
- Drilling was carried out in 200m x 200m grid and 400m x 400m grid to establish an measures and indicated Geological Resource of 331 and 332 category as per UNFC

- Drill-hole diameter: NQ (3 inch)
- Recovery: Minimum stipulated recovery was 85%; Actual average recovery was more than 85%.
- Drilling progress: 30mt/day/machine in 12 hours of drilling.
- Initially 2-3 random deep boreholes were drilled beyond the limestone formation to set the limit of the drilling depth.
- Thirty Four diamond core drill-holes were drilled in Mudhvay Sub-block C, for a 3083 m of drilling out of which 31 no. core boreholes falls in the area in focus of total meterage 2790.5.

All drill-hole locations are depicted in **Surface Plan** and **Surface Geological Plan, Plate No. 3 & 4** respectively.

Logging

Depth marking and labeling on the drill-cores were done after each run. Before logging, overall recovery of 85% was ensured.

Geological logs prepared at site considering lithological variations observed in drill cores.

Physical properties such as colour, hardness, fossil identification, grain size were observed/measured visually and recorded at site.

Calculation for extrapolated length of lithology basing on recovery.

No geotechnical data (RQD etc) was recorded.

Drilling summary logs are provided as **Annexure-X**.

Sampling

Only visually apparent carbonates were selectively sampled for assay. Sampling width varied from smallest recorded carbonate unit to a maximum of 2m from the limestone intersected.

Core splitting was done by the drilling agency; Cores were split into two halves in core splitter. Half core was sent for sample preparation at site and the other half was preserved.

Core samples collected in polythene bags, labelled and transferred to grinding machine at site. Core sample was then crushed, pulverized to – 150 microns. 500 grams of sample were labeled and sent for analysis to Inspectorate Griffith"s (IG) laboratory, Gandhidham.

Chemical Analysis

All core samples were split, crushed and pulverised to - 150 microns by the GMDC exploration team at site. The samples were split by coning and quartering and about 500gm samples were packed in polythene bag and numbered. The samples were dispatched to Inspectorate Griffiths (IG's) Gandhidam wet-chemical laboratory for assay. Limited number of samples was also sent to IG's Bhubaneshwar laboratory.

Inspectorate Griffith assayed the samples by wet chemical and instrumental method using IS 1760 (for limestone and dolomite assay) and ASTM C:25 (limestone analytical standard for AAS and ICPOES) were used. The samples were normally processed in batches of 25 samples as a standard protocol.

Specific Gravity and Bulk Density Determination

Inspectorate Griffith also carried out specific gravity measurements on limited number of core samples on dried air basis. The specific gravity ranged from 2.2 to 2.6.

After discussion with officers of CGM, Gujarat and GMDC, and considering the specific gravity of similar numulitic limestone being mined at nearby limestone quarries, a specific gravity of 2.22was suggested for calculation of resource/ reserves.

i) ***Number of pits and trenches indicating dimensions, spacing etc along and across the strike/ foliation with reference to geological plan.***

No exploration was carried out by creating pits/ trenches etc.

ii) ***Number of boreholes indicating type (Core/ RC/ DTH), diameter, spacing, inclination, Collar level, depth etc with standard borehole logs duly marking on geological plan/ sections.***

No data related to the historic exploration is available. As of now, the discussion of the recent exploration (2014-15) has been done in the text in forthcoming paras/ tables.

Table A1.3: Details of Exploration carried out in the auctioned ML area

Bore Hole No.	Collar mRL	National Grid		Depth (m)	No. of Individual Group Sample
		Northing	Easting		
KLM-001	34.0	23°43' 17.5"	68°42' 34.0"	86.50	26
KLM-02	34.0	23°43' 11.0"	23°43' 11.0"	86.50	29
KLM-03	34.10	23°43' 4.5"	68°42' 34.0"	89.50	27
KLM-04	35.15	23°42' 57.9"	68°42' 34"	95.50	19

KLM-05	38.0	23°43' 51.40"	68°42' 34.0"	95.50	32
KLM-13	32.50	23°43' 17.5"	68°42' 26.8 "	86.50	30
KLM-14	33.10	23°43' 11.0"	68°42' 26.8"	89.50	25
KLM-15	33.40	23°43' 4.47"	68°42' 26.8"	89.50	30
KLM-16	33.90	23°42' 57.9"	68°42' 26.8"	86.50	30
KLM-17	36.30	23°42' 51.4"	68°42' 26.8"	86.50	29
KLM-25	27.40	23° 43' 30.4"	68° 42' 19.7"	134.50	26
KLM-27	27.40	23°43' 30.4"	68°42' 19.7"	86.50	28
KLM-29	31.40	23°43' 17.5"	68°42'19.7 "	89.50	28
KLM-30	31.50	23°42' 17.5"	68°41' 19.7 "	95.50	29
KLM-31	31.50	23°43' 4.4"	68°42' 19.7"	86.50	25
KLM-32	32.80	23°42' 57.9"	68°42' 19.7"	83.50	30
KLM-33	30.10	23°42' 51.5"	68°42' 19.7"	95.50	29
KLM-48	30.30	23°43' 4.5"	68°42' 12.7"	80.50	32
KLM-49	32.00	23°42' 57.5"	68°42' 12.7"	77.50	27
KLM-50	32.00	23°42' 51.4"	68°42' 12.7"	84.50	28
KLM-58	23.50	23°43' 56.84"	68°42' 05.6 "	140.50	30
KLM-60	25.10	23° 43' 43.4"	68° 42' 05.6"	98.50	25
KLM-62	26.00	23 43' 29.8"	68° 42' 05.6"	137.50	30
KLM-64	28.30	23°43' 17.54"	68°42' 05.6"	98.50	33
KLM-66	29.20	23°43' 04.5"	68°42' 5.6"	41.50	09
KLM-67	30.05	23°42' 57.9"	68°42' 5.6"	59.50	20
KLM-68	28.10	23°42' 51.4"	68°42' 5.6"	80.50	23
KLM-87	29.00	23°42' 57.9"	68°41' 58.5"	83.50	30
KLM-88	27.50	23°42' 51.4"	68°41' 58.5"	77.50	25
KLM-89	26.50	23°42' 44.9"	68°41'58.5 "	62.50	23
KLM-242	27.55	23° 43' 17.5"	68° 41' 54.7"	104.50	30
KLM-318	38.22	23°43' 19.20"	68° 42'47.46"	74.50	20
KLM-319	37.76	23°43' 06.28"	68° 42'48.13"	77.50	24
KLM-320	36.12	23°42' 53.04"	68° 42'47.57"	140.50	29
Total				**3083**	**911**

(refer **Annexure-VII** for **Logs and chemical analysis)**

	Continuity of the limestone occurrence has been proved over the entire prospect through drilling at 200m and 400m grid interval. Geological logging and sampling of the drill core also display a fair degree of depth continuity of the limestone. In several cases, the drill holes have intersected the Basaltic basement rock and the local stratigraphy has been clearly defined. With the above parameters, the deposit can be categorised as G1 and G2 deposit. The core boreholes drilled has been depicted on **Surface Geological Plan & Geological Sections, Plate No. 4 & 4A**.
iii)	***Details of samples analysis indicating type of sample (surface/ sub-surface from pits/ trenches/ borehole etc.) Complete chemical analysis for entire strata for all radicals may be undertaken for selected samples from a NABL accredited Laboratory or Government laboratory or equivalent. Entire mineralized area may be analyzed meter wise with 10% of check samples. (At least for 10% of total samples may be analyzed in accordance to BIS and reports from NABL accredited/ other government laboratory).*** **Sample analysis attached from NABL accredited Lab.**
	Core Sampling and Chemical Analysis The Sub-block C of Mudhvay spread over an area of 251.90ha has been explored by 3083m of core drilling in 34 holes at 400m grid spacing. However, a part of the area to the SE has been explored at 200m grid spacing. 911 numbers of core samples from these 34 drill holes have been analysed for important constituent viz. SiO2, Al2O3, Fe2O3, CaO, MgO, Na2O, K2O, P2O5, R2O3, TiO2, MnO and LOI. All these samples have been collected over 1.5 to 2m of run length, 702 samples have been subjected to the measurement of specific gravity. Three numbers of the core boreholes i.e. KLM-318, KLM-319 & KLM-320 are falling outside the area. Deducting 73 no. samples and meterage of these boreholes i.e. KLM-318, KLM-319 & KLM-320, rest samples are 838 no. and meterage is 2790.50m effectively in the area in focus. **<u>Resources Quality</u>** Resource of Mudhvay block was estimated by developing a solid model of the ore body followed by the grade computation by Block Modeling through SURPAC software by Geovale Services. The Blocks were defined to be 50m x 50m x 10m size and the grades

were assigned using Inverse Distance Weightage method and Ordinary Kriging Method. Ordinary Kriging has been established to be having a better accuracy over the inverse Distance method.

On estimation of the block grades, resource was estimated for individual sub-blocks with basic grade subdivisions ranging from +34% CaO, 40-45% CaO, and +45% CaO in order to accommodate the cement grade as well as the sub-grade material. It has been observed that the average grade of the entire deposit with the cement grade, sub grade and waste, taken all together comes to +42% CaO which otherwise indicates that the total ore body can be considered as to be containing 100% Cement Grade material.

Table A1.4: Basic Statistics of Assay Parameters of Samples Collected from Mudhvay Sub-block C

Parameters	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	P_2O_5	Na_2O	K_2O	SO_3	LOI
Mean	8.73	3.57	2.04	42.95	2.76	0.06	0.31	0.23	0.81	37.48
Standard Error	0.18	0.07	0.05	0.20	0.05	0.00	0.01	0.00	0.03	0.11
Median	7.60	3.14	1.54	44.25	2.37	0.06	0.22	0.20	0.56	38.25
Mode	8.24	3.12	0.80	45.12	2.45	0.00	0.14	0.34	1.12	38.48
Standard Deviation	5.52	1.99	1.59	5.93	1.51	0.03	0.30	0.10	0.82	3.44
Sample Variance	30.46	3.94	2.53	35.14	2.27	0.00	0.09	0.01	0.67	11.84
Kurtosis	50.05	4.28	8.36	8.74	3.29	1.10	103.49	24.37	1.26	14.80
Skewness	5.23	1.59	2.29	-2.06	1.50	-0.09	7.60	2.85	1.35	-2.65
Range	72.05	15.71	13.54	49.85	10.76	0.22	5.28	1.44	3.98	33.66
Minimum	2.00	0.56	0.32	2.38	0.57	-0.01	0.09	0.01	0.03	8.71
Maximum	74.05	16.27	13.86	52.23	11.33	0.21	5.37	1.45	4.01	42.37
Sum	7951.60	3252.09	1855.62	39126.03	2517.96	54.89	285.71	207.41	640.65	34143.84
Count	911.00	911.00	911.00	911.00	911.00	911.00	911.00	911.00	790.00	911.00

iv) ***Expenditure incurred in various prospecting operations.***

As the exploration is carried out and hence area has already been established under G1 & G2 level of exploration by State Govt. and the same is under process of grant through auction under Mineral (Auction) Rules, 2015 hence no figures of expenditure incurred is available.

(f) ***The surface plan of the lease area may be prepared on a scale of 1: 1000 or 1: 2000 with contour interval of maximum of 10 m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 32(1)(a) of MCDR 2017***

The **Surface Plan** of the lease area prepared on a scale of 1:2000 with contour interval of 1.0m depending upon the topography of the area duly marked by grid lines showing all

	features indicated under Rule 32(1)(a) of MCDR 2017 and has been enclosed as **Plate No. 3**.				
(g)	***For preparation of geological plan, surface plan prepared on a scale of 1: 1000 or 1: 2000 scale specified under para 1.0(f) of Part A of the format may be taken as the base plan. The details of exploration already carried out along with supporting data for existence of mineral, locations proposed exploration, various litho units along with structural features, mineralized/ore zone with grade variation if any may be marked on the geological plan along with other features indicated under Rule 32 (1)(b) of MCDR 2017.***				
	The **Surface Geological Plan** of the lease area is prepared on a scale of 1:2000 with contour interval of 1.0 m depending upon the topography of the area duly marked by grid lines showing all features indicated under Rule 32(1)(b) of MCDR 2017 and has been enclosed as **Plate No. 4**.				
(h)	***Geological sections may be prepared on natural scale of geological plan at suitable interval across the lease area from boundary to boundary.***				
	A total of 13 **Geological Cross Sections** and 01 **Geological Longitudinal Section** has been prepared at 200m intervals across the Mudhvay Limestone Area. Geological Sections have been enclosed as **Plate No. 4A-I, 4A-II& 4A-III**.				
(i)	***Broadly indicate the future programme of exploration with due justification (duly marking on Geological plan year wise location in different colours) taking into consideration the future tentative excavation programme planned in next five years as in table below: -***				
Year	No. of boreholes (Core/RC/DTH)	Grid interval	Total Meterage	No. of Pits, dimensions and volume	No. of Trenches, dimensions
-	The deposit is bedded stratiform and tabular deposits of regular habit under the provision of Minerals (Evidence of Mineral Contents) Rules, 2015. From the nature and extent of the deposit, the quantum and intensity of exploration already carried out in the area is not considered adequate. Middle and upper half portion of the area is required to be exploring in terms of quantity and quality to prove the remaining area with adequate degree of reliability. The future programme of exploration is proposed during the first five years of the				

mining plan period. It has been proposed a total of 49 core bore holes in unexplored area upto a depth of 100m vertically each. The interval between two consecutive boreholes shall be 200m under the provisions of Minerals (Evidence of Mineral Contents) Rules, 2015. The exploration proposed will bring the entire area under G1 level. Details of proposed BH has been tabulated below: -

Table A1.5: Proposed Boreholes towards Future Exploration

Year of Proposal	Proposed Bore Hole No.	Grid Reference (UTM)		Depth of BH (m)	Inclination of BH (°)
		Northing	Easting		
1st to 5th years	PBH-1	2622430	469240	100	Vertical
	PBH-2	2622630	469240	100	Vertical
	PBH-3	2622830	469240	100	Vertical
	PBH-4	2623030	469240	100	Vertical
	PBH-5	2623030	469375	100	Vertical
	PBH-6	2622830	470555	100	Vertical
	PBH-7	2623030	470525	100	Vertical
	PBH-8	2623230	470545	100	Vertical
	PBH-9	2623230	469775	100	Vertical
	PBH-10	2623230	469575	100	Vertical
	PBH-11	2623230	469375	100	Vertical
	PBH-12	2623230	469240	100	Vertical
	PBH-13	2623430	469375	100	Vertical
	PBH-14	2623430	469775	100	Vertical
	PBH-15	2623430	470465	100	Vertical
	PBH-16	2623630	470340	100	Vertical
	PBH-17	2623630	470175	100	Vertical
	PBH-18	2623630	469975	100	Vertical
	PBH-19	2623630	469775	100	Vertical
	PBH-20	2623630	469575	100	Vertical
	PBH-21	2623630	469375	100	Vertical
	PBH-22	2623630	469240	100	Vertical

			PBH-23	2623830	469240	100	Vertical
			PBH-24	2623830	469375	100	Vertical
			PBH-25	2623830	469775	100	Vertical
			PBH-26	2623830	470175	100	Vertical
			PBH-27	2624030	470165	100	Vertical
			PBH-28	2624030	469975	100	Vertical
			PBH-29	2624030	469775	100	Vertical
			PBH-30	2624030	469575	100	Vertical
			PBH-31	2624030	469375	100	Vertical
			PBH-32	2624030	469210	100	Vertical
			PBH-33	2624230	469210	100	Vertical
			PBH-34	2624230	469375	100	Vertical
			PBH-35	2624230	469775	100	Vertical
			PBH-36	2624230	469975	100	Vertical
			PBH-37	2624230	470097	100	Vertical
			PBH-38	2624430	469975	100	Vertical
			PBH-39	2624430	469775	100	Vertical
			PBH-40	2624430	469575	100	Vertical
			PBH-41	2624430	469375	100	Vertical
			PBH-42	2624430	469210	100	Vertical
			PBH-43	2624630	469210	100	Vertical
			PBH-44	2624630	469375	100	Vertical
			PBH-45	2624630	469775	100	Vertical
			PBH-46	2624630	469875	100	Vertical
			PBH-47	2624830	469706	100	Vertical
			PBH-48	2624830	469575	100	Vertical
			PBH-49	2624480	469375	100	Vertical
j)	***Reserves and Resources as per UNFC with respect to the threshold value notified by IBM may be furnished in a tabular form as given below: (Area explored under different level of exploration may be marked on the geological plan and UNFC code for area considered for different categories of reserve/ resources estimation***						

may also be marked on geological cross sections).

Submit a feasibility/ pre-feasibility study report along with financial analysis for economic viability of the deposit as specified under the UNFC field guidelines may be incorporated.

The evaluation of limestone was done based on exploration data so far using standard cross sectional area method and the conversion factor of 2.22 considered for tonnage estimation.

Estimation of Resources/ Reserves

Method adopted for Resources/ Reserves estimation

Reserve/ resources are assessed with the help of cross sectional area method considering the exploration done so far.

i) Area and Depth Considered for Resources/ Reserves estimation

For estimation of geological resources, the depth encountered in each bore hole drilled has been considered.

ii) Usable Limestone

The entire limestone has been divided into three categories to facilitate the production and conservation of mineral. The categories are High Grade, Medium Grade and Low Grade. The gradation of mineral has been done in respect of % of CaO as follows:

S. No.	Gradation	%CaO	Remark
1.	High Gr.	+45.0%	%MgO is within the IBM threshold value (<4%) hence entire limestone is usable.
2.	Medium Gr.	+40.0% to -45%	%MgO is within the IBM threshold value (<4%) hence entire limestone is usable with blending in a certain proportionate with high gr.
3.	Low Gr.	+34.0% to -40%	Part of limestone may be used with blending in a certain proportionate with high gr. depending upon the %CaO and %MgO

Limestone is usable for manufacture of quality Ordinary Portland Cement (OPC) cut off

limit has been set below as prescribed by CCOM Circular No. 03/2010 dated 14.07.2010 (>34% CaO and <4% of MgO) during estimation of limestone resources/reserves.

iii) Ultimate Pit Limit in the Mining Area

The ultimate pit limit has been marked on the basis of the extent of mineralization observed within the area as per exploration known. The deepest availability of limestone is upto -84m MSL hence the ultimate depth shall be the same at a particular location not at entire expansion. Lowest ultimate depth is envisaged near boundary pillar C-07 about -25m MSL. The longitudinal section may help to understand the ultimate pit depth at various locations. Laterally the boundary barrier within the lease area forms the limit of mining upto a certain extent looking towards deepness of working and nearness of area boundary.

iv) Tonnage Factor

An overall tonnage factor of 2.22 (as per geological report issued by CGM, Govt. of Guj.) has been considered for limestone of this deposit.

Resources/ Reserves Categories

The following categories of reserves depending on the nature of exploration carried out: -

1. Inferred resources (G3 Axis): The first estimate of grade and amount of limestone in a deposit calculated purely based on data available and supplemented by surface exploration. Such an estimate is based on geological evidences, which included information from exploration report i.e. drilled core bore holes. The area covered under G3 axis is 156.47ha.

2. Indicated resources (G2 Axis): The phase of resources estimation carried out from actual exploration on geological grounds. The grade and tonnage of the ore blocks has been calculated on geological grounds based on widely spaced drill holes and pits.

In the case, the resources/ reserves which are falling within interpolation of the drilled bore holes at 400m interval. The area covered under G2 axis is 32.00ha.

3. Measured resources (G1 Axis): The resources/ reserves estimated by detailed proving operation by sinking adequate number of drill holes placed conforming to the type of deposit explored. The area covered under G1 axis is 63.43ha.

In the case, the resources which are falling within the command length of 200m on interpolation of the bore holes drilled and upto depth of the bore holes upto limestone encountered has been classified as measured category of resources. No extrapolation is

	considered for fixing geological axis in accordance of MEMC2015. **Basis for awarding UNFC code** 1) All the reserves falling under G1 axis are placed in the mineable proved i.e. E1, F1 & G1 category (111) based on the detailed exploration carried out in the part area and as the reserves are falling in the majority of Govt. land and part of santhni land for which surface right shall have by the applicant in future. This reserve is devoid of mineral resources blocked due to statutory boundary barrier, working proposed upto mineralized zone, formation of safety bench etc. As the MDPA/ lease agreement and surface right is to be obtained hence feasibility axis is being kept F2 therefore this mineral category falls within 121 UNFC. 2) All the reserves falling under G2 axis are placed in the mineable probable i.e. E1, F2 & G2 category (122) based on the general exploration carried out in the part area and as the reserves are falling in the majority of Govt. land and part of santhni land for which surface right shall have by the applicant in future. Under this reserve, no blocked material is envisaged looking towards ultimate pit limit. Sufficient space is kept for ultimate pit limit. As the MDPA/ lease agreement and surface right is to be obtained hence feasibility axis is being kept F2 therefore this mineral category falls within 122 UNFC. 3) The resources under G1 & G2 axis which cannot be mined at present due to close proximity to safe working benches, boundary barrier etc. are placed under Pre-Feasibility Mineral Resources and are classified under code 221 & 222. 4) The resources under the Inferred G3 axis are resources category outside the indicated mineral resources upto mining lease boundary are placed under 333. Pre-Feasibility Study Report is enclosed as **Annexure-VIII**.
k)	***Furnish detailed calculation of reserves/ resources section wise (When the mine is fully mechanized and deposit is of complex nature with variation of size, shape of mineralized zones, grade due to intrusion within ore zone etc, an attempt may be made to estimate reserves/resources by slice plan method). In case of deposits where underground mining is proposed, reserve/resources may be estimated by level plan method, as applicable, as per the proposed mining parameters.***
	The summary of resources/ reserves has been tabulated below.

Table A1.6: Total Geological Resources of Limestone (mio. tonnes)

Res. Cat.	Resources				Resources after loss of 10%				UNFC Code
	High Gr.	Med. Gr.	Low Gr.	Total	High Gr.	Med. Gr.	Low Gr.	Total	
331	32.25	48.04	18.83	99.12	29.02	43.24	16.95	89.21	121, 221
332	7.92	9.12	7.34	24.38	7.12	8.21	6.60	21.94	122, 222
333	74.91	57.85	33.77	166.53	67.42	52.06	30.39	149.88	333
Total	115.08	115.01	59.94	290.03	103.57	103.51	53.94	261.03	-

Table A1.7: Estimation of blocked resources (mio. tonnes)

Exploration level	Total Limestone blocked			
	High Gr.	Med. Gr.	Low Gr.	Total
In G1 level exploration (221)	0.47	0.03	0.13	0.63
In G2 level exploration (222)	0.00	0.00	0.00	0.00
Total	**0.47**	**0.03**	**0.13**	**0.63**

Table A1.8: Estimation of blocked resources after loss of 10% (mio. tonnes)

Exploration level	Total Limestone blocked			
	High Gr.	Med. Gr.	Low Gr.	Total
In G1 level exploration (221)	0.43	0.02	0.12	0.57
In G2 level exploration (222)	0.00	0.00	0.00	0.00
Total	**0.43**	**0.02**	**0.12**	**0.57**

Table A1.9: Resources blocked under various barriers (mio. tonnes)

Exploration level	Total Limestone blocked			
	High Gr.	Med. Gr.	Low Gr.	Total
UPL benching	0.43	0.02	0.12	0.57
Statutory boundary barrier				
Total	**0.43**	**0.02**	**0.12**	**0.57**

(Refer **Annexure-XIII** for detailed resources/ reserves estimation)

l)	***Mineral Reserves/ Resources:*** Mineral Reserves: (Mineral reserves are optimised at cut off 92 LSF) CaO * 100 LSF (Lime Saturation Factor) = ---------- $2.80 * SiO_2 + 1.18 * Al_2O_3 + 0.65 * Fe_2O_3$ Mineral Resources: Calculated based on area of influence and extent of ore body. Total 261.03 million tonnes of limestone resources. (Mineral resources are being estimated purely based on level of exploration, with reference to the threshold value of minerals declared by IBM)

Level of Exploration	***Resources in million tonnes***	***Grade***
G1 - Detailed exploration	89.21	Cement grade
G2 - General Exploration	21.94	Cement grade
G3 – Prospecting	149.88	Cement grade
G4- Reconnaissance	-	-

Table A1.10: Resources/ Reserves as per UNFC as on 01.10.2017

	UNFC Code	***Quantity (in mio. tonnes)***				***Grade***
		High Gr.	Med. Gr.	Low Gr.	Total	
A. Total Mineral Reserve						
Proved Mineral Reserve	111	-	-	-	-	Cement-gr.
Probable mineral Reserve	121 & 122	28.60+7.12 = 35.72	43.22+8.21 = 51.43	16.83+6.60 = 23.43	88.65+21.93 = 110.58	
B. Total Remaining Resources						
Feasibility mineral Resource	211	-	-	-	-	
Prefeasibility mineral resource	221 & 222	0.43	0.02	0.12	0.57	
Measured mineral resource	331	-	-	-	-	
Indicated mineral resource	332	-	-	-	-	
Inferred mineral resource	333	67.42	52.06	30.39	149.88	
Reconnaissance mineral resource	334	-	-	-	-	
Total Reserves + Resources		**103.57**	**103.51**	**53.94**	**261.03**	

Mine Life

- At proposed consumption during first five years i.e. about 8.04mio. tones as mentioned below: -

Year	Proposed target (mio. tonne)	Progressive total (mio. tonne)
First	Nil	0.00
Second	0.27	0.27
Third	1.06	1.33
Fourth	2.71	4.04
Fifth	4.00	8.04

- 6th year onwards, the production target will reach ultimate at 12.0mio TPA, life of mine would comes to 15 years.

Year	Proposed target (mio. tonne)	Progressive total (mio. tonne)
Sixth	5.6	5.60
Seventh	7.2	12.80
Eighth	8.8	21.60
Ninth	10.4	32.00
Tenth	12.0	44.00

- So total production proposed during first 10 years shall be
  = 8.04 + 44.0 = 52.04mio. tonne
- Rest mineable reserves = 58.54mio. tonne will lasts for 4.87 say 5.0 years
- Hence total mine life = 5+5+5 = 15 years
- Life of mine may be increased subject to conversions of resources into category of reserves 111

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2.0 MINING

2.1	***A. OPEN CAST MINING: -***
a)	***Briefly describe the existing as well as proposed method for excavation with all design parameters indicating on plans/ sections: -***
	Salient description of present mining method It is a fresh area so mine working is yet to be started after getting all due clearances/ approvals as applicable. **Proposed mining method** The mining operations have to be commenced. The mining is proposed to be carried out by fully mechanized opencast method using continuous surface miner (CSM) with combination of excavator/ loader and dumpers. No conventional method i.e. drilling and blasting is proposed. Surface miner is environment friendly machine and to be used in order to avoid blasting. The cutting depth of surface miner is 250-300mm and product size generated after cutting and milling in the range of 75-150mm. The loading is proposed to be carried out by loader/ hydraulic excavator whereas transportation by means of dumper/tippers of35te capacity. The destination of mined out limestone is end use without crushing. The transportation of mined out material shall be from belt conveyor to be installed within the boundary barrier of boundary pillars C-07 to C-01. Hopper is proposed within pit near boundary pillar C-07 from where material lifting is proposed to be transfer tower at boundary pillar C-07 from where limestone shall be conveyed to proposed cement plant along boundary barrier. The face shall be is usually oriented in east-west direction. The bench height is proposed 6.0m. One cart track is passing through mining lease area almost from central part which is temporary one as it is not marked on revenue map, Shifting of the same road shall be undertaken in future. To win mineral, it is necessary to handle waste lying as overburden hence pre production development is required. The pre production development is required includes removal of topsoil, as well as removal of overburden. Soil from a large area shall be removed first

	in order to remove overburden. Benches 6m high and working bench width +20m maintaining working bench slope of 70^0 in overburden and in limestone Surface Miners is proposed to be used for winning of mineral limestone. Overburden waste is loose material so it doesn't required drilling/ blasting and surface miner. It can directly be mined with the help of pay loader bucket and loaded in dumper. Entire medium grade and high grade material is proposed to be fed to the end users directly for further process. Low grade material may be stacked temporarily partially or fully depending upon its quality and extent of blendability. The excavation, loading and transportation is proposed to be carried out by Surface Miner, hydraulic excavator, loader, dumpers. Pay loader of capacity 5.76cum shall be used for loading of fragmented rock mass of mineral and transported to hopper to be installed inside the proposed pit through dumpers. Using of surface miner is eco-friendly mining operation specifically in area near road and boundary areas. The salient features of surface miner are safe and steady operation, minimum dust generation and low noise. It strips the strata in slices of 25-30 cm thick and wide 2.0 -2.2 m. Mine office with all necessary requirements is also proposed at boundary pillar C-01. **<u>The Broad parameters of mining operation will be as below</u>:** Number of working days : 300 days/year Working shift/day : 3 shifts of 8 hours each No. of benches : 12 Height : 6.0 m (max.) in overburden and mineral both Width : For running bench >20 m for closing (conceptual) bench 5.5 m Bench slope : 70^0 Ultimate Pit slope : 45^0
b)	***Indicate year-wise tentative Excavation in Cubic Meters indicating development, ROM, pit wise as in table below.***
	The mining operations are to be started with opencast method. Opencast method will be continued by fully mechanized means with surface miner. The plant requirement of limestone is maximum will be4.0mio. TPA during this plan

period and ultimately to 12.0mio. TPA.To meet the plant quality requirement the ROM supply is planned to optimize at required LSF and the requisite plant quality will be maintained by blending of low grade/ clay/ silica sand. Thus lower grade mineral from captive mine will be utilized which will eventually lead to mineral conservation.

ROM quantity comprise of limestone of may be mixed grade and/or of specific grade.

The stripping ratio of limestone to overburden for the first five years of mining operations is envisaged 1:1.23. Details of bench-wise year-wise development and production for the first five years has been given in table below.

Table A2.1: Expected excavation during first plan period in terms of cum

Year	OB &Soil	Waste Rock	Mineral			Ore:OB
	(in cum)		ROM	LST	Sub-Gr.	(tonnes:cum)
1st	1869264	-	nil	Nil	nil	-
2nd	1039883	-	123943	98986	24957	1:8.40
3rd	1556420	-	477053	477053	nil	1:3.26
4th	-	-	1220274	1116054	104220	1:0.00
5th	-	-	1801805	1801805	nil	1:0.00
Total	**4465567**	**-**	**3623075**	**3493894**	**129177**	**1:1.23**

Table A2.2: Expected excavation during first plan period in terms of tonnes

Year	ROM (tonne)	Usable/ Saleable (tonne)	Sub grade (tonne)	Reject (tonne)
1st	-	-	-	nil
2nd	275155	55406	219749	nil
3rd	1059059	1059059	Nil	nil
4th	2709008	2477640	231368	nil
5th	4000009	4000009	Nil	nil
Total	**8043231**	**7592114**	**451117**	nil

Conversion factor has been taken 2.22 for conversion of volume to tonnage for the purpose of mining of mineral.

The development location may change at few locations due to rainfall, surface water storage/ conservation of water in last bench.

Table A2.3: Proposal of Excavation of mineral with R.O.M. Quality and overburden to be removed during First Year

RL From	RL To	Plan Area	Avg. Bench Thickness	Volume	Soil	OB/ Waste	ROM	Low Gr.	Med. Gr.	High Gr.
m MSL	m MSL	Sqm	m	cum	Cum	cum	tonne	tonne	tonne	tonne
+	27	140000	0.30	42000	42000	-	-	-	-	-
27	24	140000	3.0	420000	-	420000	-	-	-	-
24	18	122000	6.0	732000	-	732000	-	-	-	-
18	12	112544	6.0	675264	-	675264	-	-	-	-
SUB-TOTAL				**1869264**	**42000**	**1827264**	**-**	**-**	**-**	**-**

Table A2.4: Proposal of Excavation of mineral with R.O.M. Quality and overburden to be removed during Second Year

RL From	RL To	Plan Area	Avg. Bench Thickness	Volume	Soil	OB/ Waste	ROM	Low Gr.	Med. Gr.	High Gr.
m MSL	m MSL	sqm	M	cum	Cum	cum	tonne	tonne	tonne	tonne
Development										
+	30	89216	0.30	26765	26765	-	-	-	-	-
30	24	89216	6.0	535296	-	535296	-	-	-	-
24	18	79637	6.0	477822	-	477822	-	-	-	-
Production										
12	6	25079	6.0	150474	-	75510	166432	132946	33486	-
6	0	17204	6.0	103224	-	54252	108723	86803	21920	-
SUB-TOTAL				**1293581**	**26765**	**1142880**	**275155**	**219749**	**55406**	**-**

Table A2.5: Proposal of Excavation of mineral with R.O.M. Quality and overburden to be removed during Third Year

RL From	RL To	Plan Area	Avg. Bench Thickness	Volume	Soil	OB/ Waste	ROM	Low Gr.	Med. Gr.	High Gr.
m MSL	m MSL	sqm	M	cum	Cum	cum	tonne	tonne	tonne	tonne
Development										
+	32	52459	0.30	15738	15738	-	-	-	-	-
32	30	52459	2.0	104918	-	104918	-	-	-	-
30	24	43645	6.0	261870	-	261870	-	-	-	-
24	18	39264	6.0	235584	-	235584	-	-	-	-
18	12	96101	6.0	576606	-	576606	-	-	-	-
Production										
12	6	94849	6.0	569094	-	361704	593606	-	593606	-
6	0	16578	6.0	99468	-	-	220818	-	110409	110409
0	-6	13200	6.0	79200	-	-	175824	-	-	175824
-6	-12	5166	6.0	30996	-	-	68811	-	-	68811
		SUB-TOTAL	**-**	**-**	**15738**	**1540682**	**1059059**	**-**	**704015**	**355044**

Table A2.6: Proposal of Excavation of mineral with R.O.M. Quality and overburden to be removed during Fourth Year

RL From	RL To	Plan Area	Avg. Bench Thickness	Volume	Soil	OB/ Waste	ROM	Low Gr.	Med. Gr.	High Gr.
m MSL	m MSL	sqm	m	cum	Cum	cum	tonne	tonne	tonne	tonne
6	0	110173	6.0	661038	-	-	1467504	462727	1004778	-
0	-6	93206	6.0	559236	-	-	1241504	-	124150	1117354
		SUB-TOTAL	-	**1220274**	**-**	**-**	**2709008**	**462727**	**1128928**	**1117354**

Table A2.7: Proposal of Excavation of mineral with R.O.M. Quality and overburden to be removed during Fifth Year

RL From	RL To	Plan Area	Avg. Bench Thickness	Volume	Soil	OB/ Waste	ROM	Low Gr.	Med. Gr.	High Gr.
m MSL	m MSL	sqm	m	cum	Cum	cum	tonne	tonne	tonne	tonne
-6	-12	110772	6.0	664632	-	-	1475483	-	1032838	442645
-12	-18	70792	6.0	424752	-	-	942949	-	282885	660065
-18	-24	61292	6.0	367752	-	-	816409	-		816409
-24	-30	33045	6.0	198270	-	-	440159	-	198071.73	242088
-30	-36	24400	6.0	146400	-	-	325008	-	130003.2	195005
		SUB-TOTAL	**-**		**-**	**-**	**4000009**	**-**	**1643798**	**2356211**

Tentative fresh area to be broken during the proposal period is30.00ha.

C)	***Dump re-handling (for the purpose of recovery of mineral): Estimated available material (Cum)***

Dump no.	Year wise handling	Estimated recovery of saleable material	Rejects
No dump of waste/ OB/ reject exists within the area as it is fresh grant.			

c) Enclose Individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any, etc in case of 'A' category mines.

Composite development plans showing pit layouts, dumps, stacks of mineral reject, if any, etc. and year wise sections in case of 'B' category mines.

Year wise working plan and sections showing pit layout, dumping, stacking, plantation location etc. is depicted on **Plate No. 5A to 5E & 5S**andenclosed herewith.

d)	***Describe briefly giving salient features of the proposed method of working indicating Category of mine.***	
sr	**Items**	**Details**
i)	**Method of mining** **With bench parameters**	It will be 'A' category mine to be worked by opencast method of mining with mechanization maintaining bench height of 6.0m and sloping bench at about 70 degree and working bench width >20m. The mine working is proposed to be worked in 3shifts of 8.0 hr each. The bench geometry has been described in previous para in this chapter.
ii)	**Drilling**	drilling is not proposed
iii)	**Blasting**	No blasting operations are proposed for winning mineral limestone.
iv)	**Excavation**	The geological investigations suggest that the deposit is soft and friable so opencast mechanized mining by forming systematic

		benches of 6.0 m height with proper width of about more than 20.0m and combination of surface miner-dumper to be adopted at Limestone Mine. The overburden is loose and limestone is semi-hard.
v)	**Loading**	Loading by wheel loader
vi)	**Transportation**	Overburden transportation is proposed by means of dumpers/tippers to the earmarked sites and limestone transportation by tippers to the hopper proposed inside the pit in ML area.
vii)	**Crushing/ screening**	No crushing/ screening unit is proposed as limestone after surface miner will be within the required/ desired size.
e)	***Describe briefly the layout of mine workings, pit road layout, the layout of faces and sites for disposal of overburden/waste along with ground preparation prior to disposal of waste, reject etc. A reference to the plans and sections may be given. UPL or ultimate size of the pit is to be shown for identification of the suitable dumping site.***	
	As stated in Table above, production rate of 4.0mio. TPA of limestone is proposed during the first five years (refer **Plate No.5A to 5E& 5S**). The proposed production has been tabulated in the tables above. This will result in optimum utilization of the mineral as material of lower LSF could be blended with the material of correspondingly higher CaO. 12benches are proposed to be worked during this period of mining plan. Soil and overburden (unusable mixed clay) with varying thickness is proposed to be scrapped/ dozed with dozer towards utilization for plantation and stacking/ dumping also. No electric lines passing through the area in focus so no mine working hindrance is anticipated due to this. The mine working shall be carried out in accordance with the lighounits encountered in core BH as far as possible. The bottom level where limestone encountered shall not be uniform. Somewhere it may 15m AMSL and at other places 20m AMSL. Generation and handling of process plant waste as a result of sulphate/ alkali bypass in the proposed plan is also envisaged. This material is proposed to be brought back in the	

mining lease premises with the help by dumpers/tippers. Its quantity may be about 10% of kiln feed from third year of mining onwards. Such waste shall be dumped in the mining lease area separately temporarily.

After removing overburden, further mining of limestone shall be carried out.

The details of proposed year wise working is given below: -

Tentative Development programme for First Year

This year is dedicated for development work only hence no limestone production shall be there. During this year the development will be carried out afresh at one location at corner C-07.First of all, a main haulage of about 20.0m wide is prepared from proposed pit to mine office. In between, this may help to access various mining activities.

Soil removal shall be carried out in separately first. During this year of mining operation total quantity of soil to be removed is estimated around 42000cum. This quantity is proposed to be used for preparation of earthen bund all around the block area within statutory barrier boundary 7.5m wide. In such, soil is proposed to be utilized fully for safety as well as greenbelt purposes. The earthen bund shall be covered about 2.5ha area.

OB waste is also proposed to be handled during this year. A total of 03 no. benches are proposed for OB waste removal i.e. from 27m MSL to 24 m MSL, 24m MSL to 18 m MSL and 18 m MSL to 12 m MSL. In such, a total of 18.27lac cum OB waste shall be generated which shall be disposed of by creating waste dump. The dump shall be reached a safe height of 30.0m with two terraces of 10m each. The area proposed under OB dump is about 11.0ha. The dump shall be on temporary basis. The retaining wall is proposed two sides of the dump i.e. southern and western in order to prevent haulage and cart track. This side is also natural sloping. In such a length of 780m of retaining wall is proposed to be erected.

The ramp shall be lower down to the lower benches of gradient 1in16 for safe movement. The proposed direction of working is towards south and east.

Advancement of the benches is depicted on **Plate No. 5A& 5S.**

Direction of proposal	Extent of the proposed excavation	Extent of the proposed OB Dump
N-S	2622395 to 2622800	2623607 to 2624007
E-W	469228 to 469615	469257 to 469565

	The haulage roads will be as shown in the plan for convenience of handling the material. Greenbelt/ plantation is proposed to be covered under 1.0ha on bund along boundary barrier followed by barbed fencing for safety of plantation. Fencing shall have length of about 1200m. Civil construction and erection work is proposed in this year by installation of a belt conveyor from boundary pillar no. C-07 to C-01 for transportation of limestone to proposed plant. Year wise tentative excavation for this year is shown in **Yearwise Working Plan, Plate No. 5A.** The proposed quantity & quality is tabulated in **Table** above. **Tentative Development & production programme for Second Year** This year is dedicated for development work as well as for little bit production hence limestone production shall be there for cement plant operational trial purpose. During this year the development will be carried out afresh at one location by extending benches created previously towards east and north simultaneously. Soil removal shall be carried out in separately first. During this year of mining operation total quantity of soil to be removed is estimated around 26765cum. This quantity is proposed to be used for preparation of earthen bund all around the block area within statutory barrier boundary 7.5m wide. In such, soil is proposed to be utilized fully for safety as well as greenbelt purposes. The earthen bund shall be covered about 1.60ha area. OB waste is also proposed to be handled during this year also. A total of 02 no. benches are proposed for OB waste removal i.e. from 30m MSL to 24 m MSL and 24m MSL to 18 m MSL. In such, a total of 11.42lac cum OB waste shall be generated which shall be disposed of by extending waste dump already created. The dump shall be reached a safe height of 30.0m with two terraces of 10m each. An additional area proposed under OB dump shall be about 7.0ha. The dump shall be on temporary basis also. The retaining wall is proposed one side of the dump i.e. western in order to prevent haulage. This side is also natural sloping. In such a length of 215m of retaining wall is proposed to be erected additional in continuation of previous one. The ramp shall be extended to the lower benches of gradient 1in16 for safe movement in fresh area. The proposed direction of working is towards north and east. Advancement of the benches is depicted on **Plate No. 5B& 5S.**

Direction of proposal	Extent of the proposed excavation	Extent of the proposed additional OB Dump
N-S	2622415 to 2622964	2624007 to 2624255
E-W	469227 to 469770	469257 to 469565

The haulage roads will be as shown in the plan for convenience of handling the material.

Greenbelt/ plantation is proposed to be covered under 1.0ha on bund along boundary barrier followed by barbed fencing for safety of plantation. Fencing shall have length of about 1200m.

Civil construction and erection work is also proposed in this year by installation of a hopper at near Pillar no. C07. From feeding hopper, limestone lifting to belt conveyor for transportation of limestone to proposed plant.

Mineral to be produced in this year shall be 275155tonne of low grade and med. grade both. It is anticipated that no mineral consumption shall be taken place hence limestone produced is proposed to be stacked temporarily at earmarked site covering an area of about 1.5ha separately.

Year wise tentative excavation for this year is shown in **Yearwise Working Plan, Plate No. 5B.** The proposed quantity & quality is tabulated in **Table** above.

Tentative Development & production programme for Third Year

In the year, development work as well as production of limestone shall be there. Initially advancement of upper benches shall be taken place and then production. During this year the advancement/ development will be carried out afresh at one location by extending benches created previously towards east. Total developmental benches shall be five numbers from 33m MSL to 6m MSL whereas production benches from 6m MSL to -12m MSL. Bench from 12m MSL to 6.0m MSL shall be common for both i.e. developmental as well as production.

Soil removal shall be carried out in separately first. During this year of mining operation total quantity of soil to be removed is estimated around 15738cum. This quantity is proposed to be used for preparation of earthen bund all around the block area within statutory barrier boundary 7.5m wide. In such, soil is proposed to be utilized fully for safety as well as greenbelt purposes. The earthen bund shall be covered about 0.90ha area.

OB waste is also proposed to be handled during this year. A total of 04 no. benches are

proposed for OB waste removal i.e. from 32m MSL to 30m MSL, 30m MSL to 24m MSL, 24m MSL to 18 m MSL, 18m MSL to 12m MSL. In such, a total of 15.40lac cum OB waste shall be generated which shall be disposed of by extending waste dump already created. The dump shall be reached a safe height of 30.0m with two terraces of 10m each. An additional area proposed under OB dump shall be about 10.0ha.The dump shall be on temporary basis. The retaining wall is proposed one side of the dump i.e. western in order to prevent haulage and spillage of waste. This side is also natural sloping. In such a length of 318m of retaining wall is proposed to be erected additional in continuation of previous one.

The expected quantum of plant waste is 46000 cum which may required a dumping space of 1.0ha for reaching safe height of 10.0m.

The ramp shall be extended to the lower benches of gradient 1in16 for safe movement in fresh area. The proposed direction of working is towards east.

Advancement of the benches is depicted on **Plate No. 5C& 5S.**

Direction of proposal	Extent of the proposed excavation	Extent of the proposed additional OB Dump	Extent of the Plant waste Dump
N-S	2622447 to 2622984	2624255 to 2624568	2623255 to 2623345
E-W	469240 to 469900	469257 to 469565	469335 to 469425

Mineral to be produced in this shall be about 1.05mio. tonne of medium grade and high grade both. Medium grade shall be on higher side almost double the high grade. It is anticipated that mineral consumption shall be taken place hence limestone produced is proposed to be consumed high grade and medium grade equally. So medium grade about half quantity is proposed to be stacked at the same stack by extending it. Stacking shall be covering an additional area of about 0.5ha.

The haulage roads will be as shown in the plan for convenience of handling the material.

Greenbelt/ plantation is proposed to be covered under 1.0ha on bund along boundary barrier followed by barbed fencing for safety of plantation. Fencing shall have length of about 1354m.

Year wise tentative excavation for this year is shown in **Yearwise Working Plan, Plate No. 5C.** The proposed quantity & quality is tabulated in **Table** above.

Tentative Development & production programme for Fourth Year

In this year only production work shall be there. During this year the production will be carried out at one location by deepening benches created previously.

No soil removal and OB waste generation is anticipated.

Production of limestone is proposed to be taken during this year from a total of 02 no. benches i.e. from 6m MSL to 00 m MSL and 00m MSL to -6.0 m MSL. In such, a total of 2.70mio.tonne limestone will be produced. This quantity will includes 0.462mio. tonne low grade, 1.12mio. tonne medium grade and 1.11 mio. tonne of high grade. The medium grade and high grade shall be used jointly in equal proportion whereas low grade is anticipated to be used half quantity. In such, balance quantity of low grade shall be stacked at previous mineral stack without extending the same.

The expected quantum of plant waste is 125000 cum which may required an additional dumping space of 0.5ha for reaching safe height of 20.0m at its existing dump.

The ramp shall be extended to the lower benches of gradient 1in16 for safe movement in fresh area. The proposed direction of working is towards north/ east.

Advancement of the benches is depicted on **Plate No. 5D& 5S.**

Direction of proposal	Extent of the proposed excavation	Extent of the proposed additional OB Dump	Extent of the additional Plant waste Dump
N-S	2622468 to 2622885	No additional area is required under this head	No extension along this axis
E-W	469395 to 469815		469425 to 469504

The haulage roads will be as shown in the plan for convenience of handling the material.

Greenbelt/ plantation is proposed to be covered under 1.0ha on bund along boundary barrier followed by barbed fencing for safety of plantation. Fencing shall have length of about 1255m.

Year wise tentative excavation for this year is shown in **Yearwise Working Plan, Plate No. 5D.** The proposed quantity & quality is tabulated in **Table** above.

Tentative Development & production programme for Fifth Year

In this year only production work shall be there. During this year the production will be carried out at one location by deepening benches created previously.

No sand/ soil removal and OB waste generation is anticipated.

Production of limestone is proposed to be taken during this year from a total of 05 no. benches i.e. from -6m MSL to -12 m MSL,-12m MSL to -18.0m MSL, -18m MSL to -24 m MSL, -24m MSL to -30 m MSL and -30m MSL to -36 m MSL. In such, a total of 4.0mio. tonne limestone shall be produced. This quantity will includes 1.64mio. tonne medium grade and 2.35mio. tonne of high grade. The medium grade and high grade shall be used jointly in equal proportion whereas low grade already stacked can be used with remaining quantity of high grade as well.

The expected quantum of plant waste is 185000 cum which may required an additional dumping space of 2.0ha for reaching safe height of 20.0m.

The ramp shall be extended to the lower benches of gradient 1in16 for safe movement in fresh area. The proposed direction of working is towards west and south.

Advancement of the benches is depicted on **Plate No. 5E& 5S.**

Direction of proposal	Extent of the proposed excavation	Extent of the proposed additional OB Dump	Extent of the additional Plant waste Dump
N-S	2622466 to 2622845	No additional area is required under this head	2623345 to 2623470
E-W	469335 to 469765		No extension along this axis

The haulage roads will be as shown in the plan for convenience of handling the material.

Greenbelt/ plantation is proposed to be covered under 1.0ha on bund along boundary barrier followed by barbed fencing for safety of plantation. Fencing shall have length of about 200m.

Year wise tentative excavation for this year is shown in **Yearwise Working Plan, Plate No. 5E.** The proposed quantity & quality is tabulated in **Table** above.

ix) ***Extent of mechanization-***

Describe briefly with calculation for adequacy and type of machinery and equipment proposed to be used in different activities of drilling, material handling in development and stope, hauling, hoisting to surface, surface transportation and any other operation.

Capacities Required

During the first five years of mining operations at maximum capacity in any year including waste handling and with soil is as in the third year given below: -

- Mineral per annum: 0.47mio.cum (1.06mio. tonne)
- Soil to be removed: 0.15mio cum (0.22 mio. tonne)
- OB & Plant waste to be handled: 1.89mio. cum (4.19 mio. tonne)
- Total max. handling in any year **2.53mio. cum (5.51 mio. tonne)**
- No. of operating days per annum: 300
- No. of operating shifts per day: 3
- No. of scheduled hours per shift: 8
- Actual utilization hours per shift: 6 hr 30 min.

Table A2.8: Day, shift and hour wise proposed production

Material Handling	Material handling in tonnes
Per day	18365
Per Shift	6120
Per Hour	941

The quantum and type of mining equipment proposed to be provided for various mining operations is as given below: -

1. Drilling Machines

Not required as no blasting is proposed.

2. Surface Miner

The surface miner is required for handling of limestone not for OB handling as OB can easily be handled with pay loader therefore its requirements is being based on maximum limestone production of 4.0mio. tonne. The calculations regarding adequacy of surface miner is given below:

Surface Miner

a) Cutting Width (mm)	2500
b) Cutting Depth (mm)	250
c) Avg. cutting speed (m/min.)	10
d) Specific gravity of Limestone	2.22

e) Effective cutting time per hour	50 minute excluding turning time
f) Operating hour per shift-	6.5 hrs
g) Machine availability	80%
h) Working days/Year	300
i) Production capacity tonnes per hour	2.5*.25*10*2.22*50*.8 = 555
j) Limestone handling per shift	555*6.5 = 3607 tonnes
k) Limestone handling per day @ 3 shift and 85% utilization	3607*3*.85= 9197 tonnes
l) Annual Limestone handling	4mio. tonne@ 9197 tonne/day i.e. 2.75 mio. Tonne
m) Total Surface miner required	4.0 mio. tonne/2.75 mio. tonne = 1.45 says 2 no.

3. Loading equipment

Excavator: - No excavator is proposed for loading point of view.

Front end Loader

1. Bucket Capacity (cu.m.)	5.76
2. Cycle time seconds	35
3. Utilization factor	75%
4. Bucket fill factor	75%
5. Availability	75%
6. Avg. Tonnage Factor (t/cu.m.)	2.22
7. Total shift per day	3 shifts
8. Avg. no. of working days/year	300 days
9. Production per day/Loader (tonnes)@ 3 shift and avg. 6.5 hrs/shift	((5.76*.75*.75*.75*2.22*3600)/35))*6.5*3 = 10820
10. Handling /Year/ loader (mio. tonnes)	10820*300 = 3.24
11. Yearly material handling (mio. tonnes)	5.51
12. No. of loader required	5.51/3.24 = 1.70 says 2 no.
13. Total Loader required	2 no. + 1 no. spare = 3 no.

4. Haulage and Transportation Equipment

Dumper requirement: It is proposed to transport limestone/ OB waste from the faces to the hopper/ waste dumping site by 35 tonner off highway rear dumpers. The number of equipment proposed to be provided is given in table below. The calculations regarding adequacy are given is given below: -

Capacity of Dumper (tonne)	35
Bucket Capacity of Loading unit (tonne)	5.76*2.22*.75 = 9.6
Passes required to load dumper	35/9.6 say 3.64
Cycle time of one pass (seconds)	35
Cycle time to load dumper (min.)	35*3.64 = 2.07
Cycle time to load dumper considering operator efficiency @ 85% (min.)	1.75
Avg. Cycle time to load dumper (min.)	2

Haulage time:

Avg. to and fro distance from loading point to unloading point considering three years mines operation advancement.	Avg. 2.50 km
Time taken in minutes to and fro journey considering driver efficiency @ 85% & @ 30km/hour (minutes)	6
Avg. Dumper detention and spotting time at loading point (minutes)	6
Avg. Dumper detention and turning time at unloading point (minutes)	6
Total cycle time/ trip (minutes)	6+6+6=18
No. of trips per hour	60/18=3.33
No. of trips per day	3.33*3*6.5 = 64.9
Material transported per day per dumper (tonnes)	35*64.9 = 2271
Actual tonnage transported per day per dumper Considering 3 shift working @ 85% availability and 85% utilization (tonnes)	2271*.85*.85=1640
Material transported per dumper per annum (mio.	1640*300 = 0.49

Tonne)	
Total dumper required to carry 5.51mio. tonne/annum of waste (no.)	11.24 say 12
Spare (no.)	4
Total (no.)	12+4 = 16

Table A2.9: List of Mining Machinery/ Equipment to be proposed

S. No.	Description	Nos.	Size/Capacity	Make	Motive Power	H.P
1.	Surface Miner	2	Drum width 2500 mm	Wirtgen	Diesel Engine	950
2.	Front End Loader	3	5.76 cubic meter	Komastu	Diesel Engine	315
3.	Dumpers	16	35 tonne	MAN	Diesel Engine	120
4.	Dozer	2	D-8L	CATER-PILLAR	Diesel Engine	250
5.	Water Tankers/ Sprinklers	3	20000 liters	TATA	Diesel Engine	120

Table A2.10: List of Machinery/ Equipment required for site services

S. No.	Machineries	No.	Make	Motive Power	H.P.
1.	Diesel tanker (5000 l capacity) (Truck mounted)	1	TATA / Ashok Leyland	Diesel Engine	120
2.	Mobile service van and garage equipment	1	TATA/ Ashok Leyland	Diesel Engine	120
3.	Diesel Jeeps	3	Mahindra	Diesel Engine	45 to 60
4.	Ambulance van	1	Mahindra/ TATA	Diesel Engine	45 to 60

5.	Dewatering Pump	2	Local make	Diesel Operated	10
6.	Grader	1	Caterpillar	Diesel Engine	165
7.	Compactor	1	JCB	Diesel Engine	100
8.	Portable lighting tower	4	Atlas copco	Diesel Engine	100
9.	Hydra crane	1	Escorts	Diesel Engine	60
10.	Tyre handler	1	Voltas	Diesel Engine	50

1. Above all machinery shall be on hired basis.

2. Make and capacity may differ/ changed as per specific requirement.

f) ***Conceptual Mine planning upto the end of lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, Disposal of waste, backfilling of voids, reclamation and rehabilitation showing on a plan with few relevant sections.***

General

Every mine needs to be planned in a way that the useable mineral is extracted to the maximum extent without causing severe irreversible environmental damages. In the case of the Limestone Area; the concept is to take necessary steps in order to keep the area under disturbance at any stage of mining operations to the minimum. And the applicant is proposing to operate mines on the concept of maximum utilization of low grade mineral so applicant is in the process of planning to extract the mineral upto-58m MSL after 15 years of working and -84m MSL in the conceptual stage. Rehabilitation of the mined out area shall be done with least time between damage and repair. The conceptual land use of the mine is controlled by the following factors: -

- Over-burden to be generated during mining, hence backfilling towards restoring part/ entire worked out area to pre-mining land use is feasible.
- Part of worked out area shall be backfilled with available waste.
- As it is not feasible to bring the mine pits to the ground level it is not found useful to convert it into agricultural land use entire excavated out land.
- As the area is facing scarcity of water hence found useful to convert the mined out area into rainwater storage.

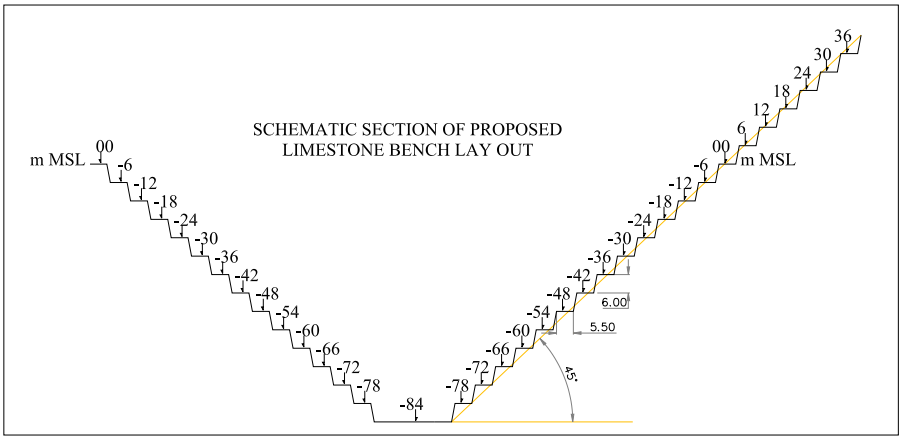
	• The surrounding areas have very low vegetation discouraging fauna habitats; hence a rainwater storage shall attract flora and fauna habitat. • A water body along with garden on backfilling will be a pleasing addition. This will dilute salinity ingress into the groundwater. Additionally, the rainwater harvested in mined out area shall induce freshwater recharge, thereby improving the quality of the groundwater in the upstream areas. In view of the above, it would be appropriate to convert the mine into a mix of water bodies to stabilize the groundwater with green belt area for ecological and aesthetic restoration. The mine planning and land reclamation shall be carried out to achieve the above aim. The disturbed land will be fully reclaimed/ rehabilitated before abandoning the mine. **Note:** - The conceptual plan has been discussed below for a period of 15 years now onwards which is well before lease period.
i)	***Exploration-***
	The deposit is bedded stratiform and tabular deposits of regular habit as per the provision of Minerals (Evidence of Mineral Contents) Rules, 2015. From the nature and extent of the deposit, the quantum and intensity of exploration already carried out in the area is not considered adequate. Middle and upper half portion of the area is required to be exploring in terms of quantity and quality to prove the remaining area with adequate degree of reliability. The future programme of exploration is proposed during the first five years of the mining plan period. It has been proposed a total of 49 core bore holes in unexplored area upto a depth of 100m vertically each. The interval between two consecutive boreholes shall be 200m under the provisions of Minerals (Evidence of Mineral Contents) Rules, 2015. The exploration proposed will bring the entire area under G1 level i.e. detailed exploration. Details of proposed BH have been tabulated in chapter Geology & Exploration.
ii)	***Excavation-***
	The mining operations during period of this mining plan are proposed to be carried out in one location. Mining shall not be carried out in statutory boundary barrier 7.5m barrier and by forming safety benches. The mining operations shall be restricted upto level of -58.0mRLafter 15 years of working and -84m MSL after entire exhaustion of mineral after exploration of

entire area. In such hydro-geological study has to be carried out.

No other feature is present in the ML area which is likely to affect the design of ultimate working.

The limestone of the area shall be mined out at overall ore to OB ratio 1:1.71.

The layout of ultimate pit extension and depth has been designed to reach ultimate angle of 45 degree by keeping bench height 6.0m, width 5.5m depth upto ultimate depth. The schematic section of ultimate layout (after complete detailed exploration) of mine working with bench configuration is shown in figure below:-



<u>The broad parameters of conceptual mine design is as below</u>:

Benches to be developed	:	22 no.
Ultimate bench height	:	6.0 m (max.)
Ultimate bench width	:	5.5 m
Ultimate face slope	:	70^0
Ultimate pit slope	:	45^0

Total one pit shall be there at the end of mine life as detailed below: -

Table A2.11: Ultimate Dimensions of Pits at the end of mine life

S. No.	Pit No.	Dimensions of Pit (m*m)	Pit bottom (m MSL)	Overall Pit slope	Area covered (ha)
1.	1	1450*1324	-58.0 max. as per present exploration & -84m MSL after complete area under exploration	45^0	163.65

Fresh mineable area shall be taken up for development and exploitation simultaneously. After the entire mineral exhaustion and as backfilling is envisaged, the voids shall be used for accumulation of rainwater which will be part of rainwater harvesting scheme.

Thus the excavated areas will be beneficial to human being, flora and fauna, in this water starved region of Kachchh district of Gujarat State.

During the entire mine life following activities are proposed to be carried out.

1. Development

During this period removal of OB is envisaged from mineable area. Other than production activities, routine developmental activities shall be there. Mine office with other necessary infrastructures is proposed to be established in the area.

Initially, pre-production development work shall be commenced near boundary pillar C-07 where hopper is proposed from where material lifting shall be taken place discharging in belt conveyor feeder leading to plant.

Mine working shall be performed by opencast fully mechanized method. Benches geometry has already been discussed previously in the same chapter. First five years working has been discussed in above paras.

Ultimately mining is proposed within the ultimate pit limit which is drawn based on known detailed and general exploration.

2. Production

The production of limestone is proposed at 4 mio. tonne/annum during first five years of working and 6^{th} year onwards, the production target is planned to reach ultimate at 12.0 mio TPA in 10^{th} year of working. In such case, life of mine would come to 15 years.

The areas have also been identified for working in a block of 5 years upto mine life as shown in **Conceptual Plan, Plate No. 7**.

Table A2.12:Phase wise Working Programme for the Mine Life

S. No.	Phase	Duration In years	Proposed production (mio. tonne)	Excavation Area (ha)
1.	From 1st year to 5th year (Plan period)	05	8.04	30.00
2.	From 6th year to 10th year	05	44.00	65.00
3.	From 11th year to 15th year	05	58.54	68.65
4.	Total		110.58	163.65

Table A2.13: Stage Wise Land Use and Reclamation Area (ha)

S. No.	Land Use Category	Pre-Operational (Present)	Operational (At the end of plan period)	Post-Operational (At the end of Lease period/ Life of Mine)
1.	Soil Bund	Nil	5.0	5.0
2.	Waste Dump	Nil	31.50	Nil
3.	Excavation	Nil	30.00	163.65
4.	Cart track/mine road	1.50	6.00	6.00
5.	Infrastructure	Nil	0.10	nil
6.	Township Area	Nil	nil	nil
7.	Built-up area	0.05	0.05	0.01
8.	Mineral Storage	Nil	2.00	nil
9.	Undisturbed area	250.35	172.25	72.24*
10.	Total	251.90	251.90	251.90
11.	Backfilled area	nil	Nil	163.65 keeping void upto 25m bgl
12.	Plantation & Greenbelt	nil	5.0	83.50**

** Plantation includes 5.0ha on bund along boundary.

* total includes 5.0ha plantation on bund

iii)	***Waste Disposal-***

Overburden

The OB generated shall be dumped simultaneously at the prescribed sites. As the mineral availability is in quite depth till that working is proposed. There are proposed a total number of one dumping location. The height proposed of dump shall be 30m with terraces of 10m each. The width between two terraces shall be 15m for easy access.

OB dumping shall be kept for a period of first three years in this mining plan hence cannot be stabilized. This may risk in spreading the waste material. On the other hand, space for backfilling shall be matured in sixth year. In such, 6thyear onwards, backfilling shall be started with available OB waste. OB dumped shall be provided retaining wall to check its spread. (**Conceptual Plan, Plate No. 7)**

Table A2.14: Generation of OB and its disposal

Year	Generation of OB (mio. cum)	OB disposal means	Location	Area covered/ additional area proposed under dumping (ha)
1st year to 5th year	4.46	Dumping at one location	In-between area boundary pillar no. C-	28.00
6th year to 10th year	11.24	Simultaneously backfilling	-	Nil
11th year to 15th year	13.42		-	Nil
Total	**29.12**	**-**	**-**	Nil at the end of mine life/ lease period

OB re-handling is envisaged as the mined out area is get matured for backfilling which is anticipated by sixth year of working. The backfilling shall be started only after confirmation of non-availability of limestone beneath.

It is anticipated that due to backfilling of OB, the entire excavated out area 163.65ha will able to keep void upto 30m bgl in accordance with MOEF&CC at the end of mine life/ lease period.

Plant waste

The plant waste generated shall be dumped simultaneously at the prescribed sites. One dumping location is proposed for plant waste. The height proposed is 20m with one terrace of 10m. The width between two terraces shall be 15m for easy access.

Plant waste generation and its dumping shall be started from third year of mining. Space for backfilling is anticipated to be matured in sixth year of mining. In such, backfilling of plant waste shall be started 6th year onwards only.

Table A2.14: Generation of Plant waste and its disposal

Year	Generation of plant waste (mio. cum)	Waste disposal method	Location	Area covered/ additional area proposed under dumping (ha)
1st year to 5th year	0.35	Dumping at one location	In-between area boundary pillar no. C-	3.50
6th year to 10th year	2.00	Simultaneous backfilling	-	nil
11th year to 15th year	2.70		-	nil
Total	**5.05**	**-**	**-**	nil at the end of mine life/ lease

The backfilling of plant waste shall be started along with backfilling of OB waste. The backfilling of plant waste will reduce the void area upto about 5m over the entire excavated out area 163.65ha at the end of mine life/ lease period.

Soil

In the same manner, soil/sand is also proposed to be disposed of by means of making bund all around the boundary barrier of height 2.0m towards safety of the auctioned area. No soil is anticipated to be remained for stacking.

Table A2.15: Removal of soil and its disposal

Year	Removal of soil (mio. cum)	Soil disposal method	Location	Area covered/ additional area proposed (ha)
1st year to 5th year	0.08	Utilized for Earthen Bund	Temporarily stacking grid reference has been given in previous	Earthen bund – 5.0ha Stack –nil
6th year to 10th year	0.21	Simultaneously utilization for plantation	-	Nil
11th year to 15th year	0.19		-	Nil
Total	**0.48**	**-**	-	nil at the end of mine life/ lease

The excavated out area is proposed to be utilized for accumulation of rainwater which shall be very much useful for the local in terms of replenishment of ground water.

iv) Reclamation and rehabilitation -

Reclamation

The mining area shall be gradually developed and exploited for limestone. It is estimated that by the end of lease period, entire mineable limestone reserves will be exhausted based on present exploration.

Looking towards availability of OB waste, backfilling of entire bottom area is envisaged keeping upper portion void about or 25m bgl. The voids are below the general ground level so can be used for storage of rainwater. The accumulated water shall be kept suitably fenced off all around, if required.

Total voids area envisaged till lease period = 163.65 ha

Total volume of voids envisaged till lease period = 75 mio. cum

Total OB and plant waste generation envisaged till lease period = 34.17 mio. Cum

Total soil removal envisaged till lease period = 0.48 mio. cum

Total waste available for backfilling envisaged till lease period= 34.17*1.3 = 44.42mio. cum

Total backfilling area envisaged till lease period = 163.65ha (not upto general ground level)

Part of the pit is proposed to make suitable rainwater storage at the end of lease period

covering area 82.13ha and remaining part of lower side for rainwater collection.

Table A2.16: Programme of backfilling

Year	Loose waste to be utilized for backfilling (mio. cum)	Location	Area to be backfilled (ha)
1st year to 5th year	No proposal	-	nil
6th year to 10th year	19.0	Entire half excavated out portion	40.0
11th year to 15th year	25.26		123.65
Total	**44.26**		163.65

It is proposed to create rainwater storages over lower portion of the void during the conceptual period/ lease period. The upper backfilled area is proposed to be vegetated by planting suitable species.

Rehabilitation

It has already been mentioned that the area of mining lease is free from any habitation and therefore there will not be any oustees.

Afforestation Program

Company has a plan to plant saplings of trees and shrubs all along the periphery of the area boundary and other area on backfilled area. Plantation is proposed to be done at the rate of 1000 saplings per hectare and area 1.0ha per year. Overburden soil removed during mining is proposed to be used for plantation purposed.

Total area covered under plantation/greenbelt proposed is 83.50ha at end of lease period/mine life out of which: -

1. Boundary greenbelt = 5.0ha
2. On backfilling = 78.50ha

By the end of this mining plan period, an area of 5.0ha area under greenbelt shall be added to greenbelt/ plantation.

When the mine is exhausted completely, entire area of ML will have one large water storage and big gardens with trees and shrub, which will be beneficial of human population of the region in the area of Kachchh District.

The relevant help for successful reclamation/ afforestation will be taken from experienced Forest Officials.

The following trees are already planted and also recommended: -

Table A2.17: Species of saplings proposed

S. No.	Botanical Name	Local Name
1.	Acacia auriculiformis	Bangalibaval
2.	Acacia nilotica	Deshi babul
3.	Albezialebbeck	Siras
4.	Azadirectaindica	Neem
5.	Bamboo spps.	Vans
6.	Cassia fistula	Amaltas
7.	Cassia seamea	Kashod
8.	Casuarinaequisetifolia	Saroo
9.	Cordiasebestina	Cordia
10.	Dalbergiasissoo	Shisam
11.	Delonixregia	Gulmohar
12.	Ficusreligiosa	Pipal
13.	Jetrophaspps.	RatanJyot
14.	Teetona	Teak
15.	Parkinsonia spp.	Rambaval
16.	Peltoforumferrungium	Sonmohar
17.	Pithecelobiumdulse	Gorasimli
18.	Phyllanthusembelica	Amla
19.	Pongamiapinnata	Karanj
20.	Salvadoraspps.	Pillu
21.	Sygygium	Jambun
22.	Thespeciapopulanee	Portia tree
23.	Cocosnuciphera	Coconut
24.	Sapotasps	Chiku

The afforested area has to be protected from cattle menace, soil erosion, plant diseases etc. Plants will be protected from diseases by application of proper pesticides. Soil working, manuring etc. will be done whenever necessary. Plants will be protected from cattle menace by proper watch and ward or fencing. Damaged plants will be replaced with new one.

Post mining land use pattern

Table A2.18: Land Use Pattern at end of mine life (in ha)

Particulars	Forest Land	Santhni Land	Grazing Land	Govt. Waste Land	Others	Total
a) Pits & Quarries	-	68.45	-	95.20	-	163.65
b) Soil bund	-	2.50	-	2.50	-	5.00
c)Infrastructure including of office/ built-up area	-	-	-	0.10	-	0.10
d) Haul roads/ roads	-	0.62	-	5.38	-	6.0
e) Others (i) Govt. land (ii) Santhni land	- -	- 35.93	- -	41.22 -	- -	41.22 35.93
Total occupied Area	-	107.50	-	144.40	-	251.90

f) Area reclaimed/ rehabilitated by mine owner = 163.65ha

g) Area afforested by mine owner = 83.50ha

The final land use and restoration plan including conversion of the void into rainwater storage and plantation position etc. are depicted on **Conceptual Plan, Plate No. 7**.

2.2 ***<u>UNDERGROUND MINING-</u>***

Not applicable

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3.0. MINE DRAINAGE

a)	***Minimum and maximum depth of water table based on observations from nearby wells and water bodies***
	Observation from nearby wells & bore wells in the area reveal that depth of water table is upto 13m bgl in the surrounding (as per 'Ground water Year Book' issued by CGWB, West Central Region, Ahmedabad in Dec.2016).No hydro-geological study is carried out for the mining lease area so far. The ground water level of the area in focus could not measure as there is no source of the same. Based on working mine in vicinity reached upto level -1.0m below MSL has not been encountered ground water level.
b)	***Indicate maximum and minimum depth of Workings.***
	Presently no mining operation is carried out. During the first five years of working, mining operations is envisaged upto a level of -36.0m MSL.
c)	***Quantity and quality of water likely to be encountered, the pumping arrangements and places where the mine water is finally proposed to be discharged***
	No seasonal drains exist in the area. Ground water intersection envisaged due to mine working which is proposed upto-36.0m MSL maximum during the plan period. Sea water ingress possibilities can be set aside looking towards the Panandharo Lignite Mine where no sea water ingress noticed despite of mine working touched below -50m MSL. Sea water encountered, if any shall be disposed of as per the outcomes of Hydro-geological Report. Possibly sea water may be transported to the de-salination plant proposed within the proposed cement plant for purification purposes towards its further use as normal water. The rainwater falling in the catchment area of the proposed mine pits is proposed to be stored in the lower benches in pits shall be pumped out used for dust suppression and watering plants. Necessary pumping arrangements shall be made. Ground water analysis has been enclosed as **Annexure-X**.
d)	***Describe regional and local drainage pattern. Also indicate annual rain fall, catchments area, and likely quantity of rain water to flow through the lease area, arrangement for arresting solid wash off etc.***
	The Limestone Mine is devoid of perennial or seasonal river/ nallah through the area. The rainwater flows as per natural flow in the un-worked area down-stream to the sea. Regionally the drainage of the area is controlled by seasonal nallah Mudhvay which meets

	the Kori Creek which is an estuarine inlet of the Arabian Sea. The recorded average rainfall in area is +300 mm per annum. During the year in which the rainfall is less and consequently precipitation is less it results in drought condition. However, as a precaution towards flash floods due to heavy rains, if any, caused due to cyclonic conditions, one sump has to be proposed to be developed for storage of handsome quantity of rain (sweet) water. Rainwater shall be conserved for dry months. Catchment area is quite big as it does not form a part of any major river system. The water shall be used for consumption in the mine for dust suppression and plantation and also supplied to the villagers. The quality of rainwater remains intact as no effluent is being mixed with and on the other hand no contamination is envisaged as the mineral limestone is non-toxic in nature.

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4.0 STACKING OF MINERAL REJECT/ SUB-GRADE MATERIAL AND DISPOSAL OF WASTE

a) Indicate briefly the nature and quantity of topsoil, overburden/ waste and Mineral Reject to be disposed off.

On an average about 0.3m cover of overburden soil is available in the ML area. Overburden soil is brown material and is suitable for plantation occupying the flatter grounds.

The part of soil shall be removed separately and used for bund within the statutory barrier all around the area. No soil is proposed to be stacked.

OB generated is proposed to be stacked temporarily at earmarked site of dimensions 963m*286m and height 30m.As narrated earlier, plant waste generated is proposed to be dumped temporarily at earmarked site within the property keeping the dimensions 220m*169m and height 20m.

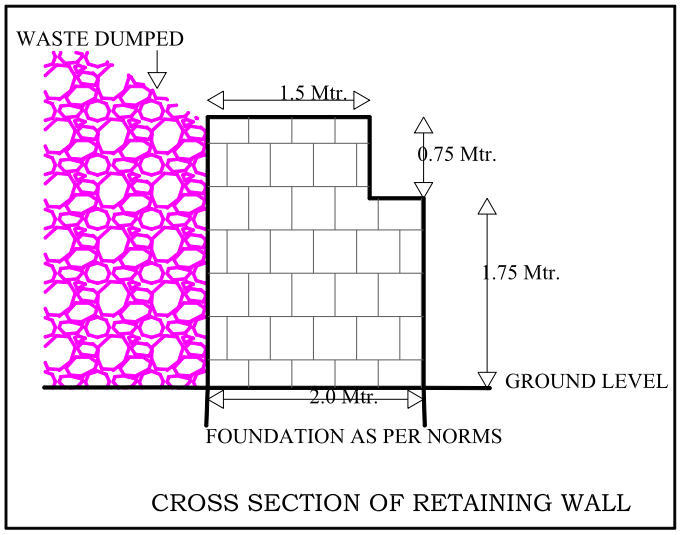
The yearly removal/ generation of sand/soil, OB & plant waste is furnished in table below: -

Table A4.1: Generation of soil, OB & Plant waste during first five years (in cum)

Year	Sand/ Soil	OB waste	Plant waste
1st	42000	1827264	-
2nd	26765	1142880	-
3rd	15738	1540682	46000
4th	-	-	125000
5th	-	-	185000
Total	**84503**	**4510826**	**356000**

Table A4.2: Use of soil during first five years (in cum)

Year	Opening stock	Soil reuse	Soil storage	Mineral reject Backfilling	Mineral reject Storage	Mineral reject Blending	Beneficiation
1st	Nil	42000	Nil	-	-	-	-
2nd	Nil	26765	Nil	-	-	-	-
3rd	Nil	15738	Nil	-	-	-	-
4th	Nil	-	-	-	-	-	-
5th	Nil	-	-	-	-	-	-
Total	**Nil**	**84503**	**Nil**	**-**	**-**	**-**	**-**

	Sand/Soil, OB & plant waste is non – toxic in nature and there is no harm from the same**.**
b)	***The proposed dumping ground within the lease area be proved for presence or absence of mineral and be outside the UPL unless simultaneous backfilling is proposed or purely temporary dumping for a short period is proposed in mineralized area with technical constraints & justification.***
	Soil removed during first five years is proposed to be disposed of by means of making bund along the ML boundary so no stacking is required. The height of the bund shall be about 2.0m,which will cover an area of 5.0ha. OB generated shall be dumped in between boundary pillar no.C-07 & C-01 attaining height of 30m in two terraces of 10m each. Retaining wall shall be constructed all around the active waste dumps. Retaining wall is proposed along the dump side towards the nearest mining lease boundary i.e. boundary line 'C-07 to C-01' and retaining wall along sloping side. The dimension of retaining wall proposed is furnished below:  CROSS SECTION OF RETAINING WALL Retaining wall to be constructed all around the dump at suitable locations. Two such locations are chosen to be taken under retaining wall. The yearwise construction of retaining wall is envisaged: - 1st Year– 780m 2nd Year– 215m 3rd Year – 318m 4th Year – nil 5th Year – nil

c)	***Attach a note indicating the manner of disposal of waste, configuration and sequence of year wise build up of dumps along with the proposals for protective measures.***

Year	Space with height required for plant waste dumping (area in ha *H in m)	Space with height required for OB dumping (area in ha *H in m)
1st	nil	Area 11.0ha of 30m height in two terraces of 10m each
2nd	nil	Area 7.0ha of 30m height in two terraces of 10m each
3rd	Area 1.0ha of 10m height	Area 10.0ha of 30m height in two terraces of 10m each
4th	Area 0.50ha of 20m height in one terrace of 10m	-
5th	Area 2.0ha of 20m height in one terrace of 10m	-
Total at the end of plan period	**Area 3.50ha of 20m height in one terrace of 10m**	**Area 28.0ha of 30m height in two terraces of 10m each**

Plant waste dumping shall be in accordance with applicable environment law. No space is under soil stacking as the soil removed is being used simultaneously.

Year	Grid Reference of Proposed OB Dumping area	
	Northing	**Easting**
1st	2623607 to 2624007	469257 to 469565
2nd	2623607 to 2624255	no extension along this axis
3rd	2623607 to 2624568	no extension along this axis
4th	No additional space is required as no waste generation is there	
5th		

Year	Grid Reference of Proposed Plant Waste Dumping area	
	Northing	Easting
1st	no dumping	
2nd	no dumping	
3rd	2623255 to 2623345	469335 to 469425
4th	no extension along this axis	469425 to 469504
5th	2623345 to 2623470	no extension along this axis

Dump Design:-

- The slope stability of waste rock dumps will be maintained with overall angle of 37° and the side slopes will be 45° from horizontal.
- Terracing at each 10.0m shall be provided of 10m width for easy movement and safety of dump.
- Garland drain shall be constructed, if required to check siltation around dumps.
- Settling tanks will be constructed at suitable places from where silt deposit will be collected.
- Run-off water is clean and used for mining activities.

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5.0 USE OF MINERAL AND MINERAL REJECT

The following are to be furnished in the interest of mineral conservation

a)	***Describe briefly the requirement of end-use industry specifically in terms of physical and chemical composition.***

The limestone produced from this auctioned Mining Lease area shall be used for cement manufacturing and trading purpose. The Mining lease area has been auctioned by State Govt without defining end use. Therefore the blending of the various grades of limestone is designed in a set ratio to meet out required raw mix.

The ROM quality of mineral is about CaO43% of mineable reserves under UNFC code 121& 122. This quality is an average quality of mineral limestone based on bore holes drilled in the area. The entire mineable reserves under UNFC 121 & 122 shall be made usable by utmost efforts of the proposed plant officials. For cement manufacturing, proper blending of high grade, medium grade and low grade reserves available in the deposit in planned and accordingly the raw mix has been decided..The applicant shall be using other additives i.e. clay/silica sand, low grade limestone (CaO 38.45%) and coal with lignite for optimal use of limestone resource.

Table A5.1: Chemical composition of Different Raw Mix Components

Raw mix component	Chemical Composition %										
	LOI	**SiO2**	**Al2O3**	**Fe2O3**	**CaO**	**MgO**	**K2O**	**Na2O**	**SO3**	**TiO2**	**Cl**
LST	38.49	7.18	3.16	1.55	45.29	2.17	0.21	0.36	0.54	0.11	0.063
Low grade LST	31.75	20.04	2.42	3.32	38.45	2.28	0.16	0.01	0.78	0.27	0.064
Silica Sand	0.26	97.92	1.07	0.40	0.11	0.04	NA	NA	NA	NA	NA

NA – Not analyzed

The result of the optimal theoretical raw mix with use of imported coal and lignite as fuel in ratio of 50:50 is proposed. The use of different components in the most optimal raw mix is given in Table below.

Raw Mix component	% use in raw mix
Limestone	73.62
Low grade limestone	24.14
Silica Sand	2.24

The theoretical raw mix study has established the following:

- The ROM limestone is suitable for manufacturing of clinker with use of South African coal and lignite as blended fuel.
- From the theoretical raw mix study, it is observed that the resultant Cl value in clinker is high (0.09%) due to presence of inherent high Cl content in limestone and low grade limestone. Theoretically about 10.3% chloride by pass is foreseen to maintain the Cl to about 0.02% in clinker.
- The alumina modulus in the resultant clinker with the use of imported coal and lignite in 50:50 ratio is comparatively high and may result into hard burning and low coating formation. It is to start the operations initially with 10-20% lignite in the blended fuel and based on the results of operations; the percentage of lignite in the blended fuel can be increased gradually.
- Although the feasible theoretical raw mix has three components, however the plant is proposed to be designed to accommodate four components raw mix, if any requirement of additional raw mix component arises on later date.

b) ***Give brief requirement of intermediate industries involved in up-gradation of mineral before its end-use.***

Not applicable

c) ***Give detail requirements for other industries, captive consumption, export, associated industrial use etc.***

	The mineral mined out from the limestone area shall be used for cement manufacturing and trading.
d)	***Indicate precise physical and chemical specification stipulated by buyers***
	Not applicable
e)	***Give details of processes adopted to upgrade the ROM to suit the user requirements.***
	No process shall be adopted to upgrade the ROM at mine site. The mineral limestone shall be processed in proposed cement plant for specific purpose.

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6.0 PROCESSING OF ROM AND MINERAL REJECT

a)	***If processing/ beneficiation of the ROM or Mineral Reject is planned to be conducted, briefly describe nature of processing/ beneficiation. This may indicate size and grade of feed material and concentrate (finished marketable product), recovery etc.***
	The ROM (limestone)shall be utilized for cement manufacturing by dry process. There is no wet processing or beneficiation necessary to upgrade the limestone at mine site. The ROM material shall directly be fed to the hopper to be installed inside the pit in the area for further process. Plant waste generation about 10% shall be transported to the mining lease area for disposal by means of dumping.
b)	***Give a material balance chart with a flow sheet or schematic diagram of the processing procedure indicating feed, product, recovery, and its grade at each stage of processing.***
	Not applicable
c)	***Explain the disposal method for tailings or reject from the processing plant.***
	Not applicable
d)	***Quantity and quality of tailings /reject proposed to be disposed, size and capacity of tailing pond, toxic effect of such tailings, if any, with process adopted to neutralize any such effect before their disposal and dealing of excess water from the tailings dam.***
	Not applicable
e)	***Specify quantity and type of chemicals if any to be used in the processing plant.***
	Not applicable
f)	***Specify quantity and type of chemicals to be stored on site / plant.***
	Not applicable
g)	***Indicate quantity (cum per day) of water required for mining and processing and sources of supply of water, disposal of water and extent of recycling Water balance chart may be given.***
	The water for mining is required in terms of industrial use and domestic use. Water requirement shall be fulfilled from desalination plant proposed in cement plant and mine water, if any.

Spraying of water on the haul roads will not generate any waste water as the same would evaporate or percolate to lower levels through the strata below. There shall be no recycling of water on this account. No waste water is envisaged to be discharged.

The water balance for the mine is as below: -

Water Requirement per day		**Discharge**
Activities	**Quantity (m^3)**	**Quantity (m^3)**
Domestic Use	25.0	Zero
Industrial Use (plantation, spraying for dust suppression)	225.0	Zero
Total Requirement	**250.0**	**Zero**

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7.0 OTHERS

Describe briefly the following:

a)	***Site Services***	
	The following Site services is proposed to be developed at proposed mining site: - 1. Mines Offices for Managerial Staff, 2. Vocational Training Centre 3. Time Office 4. First-aid Room 5. Canteen 6. Rest Shelter For machinery work shop and related machines i.e. fuel filling, company shall have hired equipments. The First-Aid Station shall have the necessary facilities for imparting first-aid to the injured. It is located in the mine. Temporary rest shelters shall be constructed in the mine site. Canteen facilities shall be maintained for the benefit of field staff and workers in the mines. Trees and shrubs shall be grown and developed all around site services.	
b)	***Employment potential-***	
	Officer* and Staff (Highly Skilled)	13
	Skilled	132
	Semi-Skilled	10
	Un-Skilled	15
	Total	170

The following officials in accordance with the provisions of the MMR 1961 and MCDR 2017 are proposed at the mines.

Statutory Employment Potential: -

Statutory requirement	Qualification	No.
Mine Manager under Reg. 34 of MMR 1961	Mine Manager's Certificate of Competency	1
Asst. Manager		1
Mining Engineer (Asstt. Managers) under Rule 55 of MCDR 2017 for every shift	BE – Mining with first/second class certificate	3

Geologist under Rule 55 of MCDR 2017	M.Sc. (Geology)	1
Mine Foreman as per MMR	Certificate of Competency	3
Mining Mate as per MMR	Certificate of Competency	3
Surveyor as per MMR	Certified	1
Total		13

Non Management Staff: -

Requirement	No.
Operators	108
Mechanics	10
Auto Electricians	2
Mechanical/ Electrical helper	10
Clerks	2
Total	132

Labour: -

Requirement	No.
Semi-Skilled	10
Unskilled	15
Total	25

Total Tentative Employment: -

Requirement	No.
Management	13
Non management	132
Labour	25
Total	**170**

Employment other than highly qualified staff shall be of contractors towards operations (OB handling and mineral raising) and maintenance.

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8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR'2017

8.1 Environment Base line information: Attach a note on the status of baseline information with regard to the following.

a) ***Existing land use pattern indicating the area already degraded due to mining, roads, processing plant, workshop, township etc in a tabular form.***

Table A8.1: Existing Land Use Pattern (in ha)

Particulars	Forest Land	Santhni Land	Grazing Land	Govt. Waste Land	Others	Total
b) Pits & Quarries	-	-	-	-	-	-
b) Dumps of ore Waste & O.B./ Soil stack	-	-	-	-	-	-
c)Infrastructure, built up area etc.	-	-	-	-	-	-
d) Haul road/ cart track	-	0.02	-	1.48	-	1.50
e) Water body	-	-	-	-	-	-
f) Others (i) Govt. land (ii)Santhni land	- -	- 107.48	-	142.92 -	-	142.92 107.48
Total occupied Area	-	107.50	-	144.40	-	251.90

g) Area reclaimed/ rehabilitated by applicant= Nil

h) Area afforested by applicant = Nil

b) ***Water regime, quality of air, ambient noise level, flora, climatic conditions***

The auctioned deposit area is general low lying flat land without any mounds and occupied by sand/soil. The block has a relief of 15 m, with altitude ranging from 22 m AMSL to 37 m AMSL. The topography is gently rolling and a thin 1 – 3 m veneer of sand/ soil. The block is located about 6 kms from the Kori Creek, which forms an estuarine inlet to the Arabian Sea, further south.

No seasonal/ perennial river/ nallah passed through the area. Rainwater flows as per natural slope of the area. The general slope of area is towards west direction.

Ground Water

As per the year book issued by the CGWB, the stage of ground water development of Lakhpat Taluka is 24.40% which is under safe category. The depth of ground water table is more than 13m bgl in the nearby area.

Limestone in the mine area does not have any primary porosity. The ground water occurs within the secondary porosity of limestone & other formation. The ground water occurs in unconfined state over the study area.

Water Quality

To evaluate the physico-chemical characteristics of the water resources existing in the surrounding area, water samples were collected during the august month and characterized for physico-chemical parameters. Water samples from one ground water source were characterized. The location of water sampling stations is near mine site (ground water) and Mudhvay (ground water).

Sample from ground water source was collected by adopting grab sampling. The sample was filled into a sampling bottle. The physico-chemical quality of water sample was characterized by adopting the relevant parts of IS.

Ground Water Quality

The test for ground water shows that all the parameters are well within the desirable limits for few parameters. Fluoride is also within the desirable limit. The water is not suitable for drinking and other purposes.

Table A8.2: Results of ground water near mine site

PARAMETERS	UNIT	TEST METHOD	DESIRABLE LIMIT IS 10500 : 2012	PERMISSIBLE LIMIT IS 10500 : 2012	RESULT
PHYSICAL PARAMETERS :					
pH	-	IS:3025 (Part-11)	6.5-8.5	No Relaxation	7.16
Electrical Conductivity at 250C	µS/cm	IS:3025 (Part-14)	-	-	3400
Total Dissolved Solids	mg/l	IS:3025 (Part-16)	500	2000	1893

Colour	Hazen	IS:3025 (Part-4)	5	25	1.0
Turbidity	NTU	IS:3025 (Part-10)	5	10	1.1
CHEMICAL PARAMETERS :					
Total Alkalinity	mg CaCO3/l	IS:3025 (Part-23)	200	600	440
Sodium, Na+	mg/l	IS:3025 (Part-45)	-	-	260
Potassium, K+	mg/l	IS:3025 (Part-45)	-	-	16.25
Calcium, Ca++	mg/l	IS:3025 (Part-40)	75	200	242
Magnesium, Mg++	mg/l	IS:3025 (Part-46)	30	100	128
Total Hardness	mg CaCO3/l	IS:3025 (Part-21)	300	600	759
Chloride, Cl -	mg/l	IS:3025 (Part-32)	250	1000	1130
Sulphate, SO4--	mg/l	IS:3025 (Part-24)	200	400	215
Nitrate, NO3-	mg/l	IS:3025 (Part-34)	45	No Relaxation	4.0
Iron. Fe	mg/l	IS:3025 (Part-53)	0.3	No Relaxation	0.01
Fluoride, F	mg/l	IS:3025 (Part-60)	1.0	1.5	0.68

Table A8.3: Results of ground water near village Mudhvay

PARAMETERS	UNIT	TEST METHOD	DESIRABLE LIMIT IS 10500 : 2012	PERMISSIBLE LIMIT IS 10500 : 2012	RESULT
PHYSICAL PARAMETERS :					
pH	-	IS:3025 (Part-11)	6.5-8.5	No Relaxation	7.65
Electrical Conductivity at 250C	µS/cm	IS:3025 (Part-14)	-	-	2500
Total Dissolved Solids	mg/l	IS:3025 (Part-16)	500	2000	1575
Colour	Hazen	IS:3025 (Part-4)	5	25	0.5
Turbidity	NTU	IS:3025 (Part-10)	5	10	1.2
CHEMICAL PARAMETERS :					
Total Alkalinity	mg CaCO3 /l	IS:3025 (Part-23)	200	600	390
Sodium, Na+	mg/l	IS:3025 (Part-45)	-	-	490
Potassium, K+	mg/l	IS:3025 (Part-45)	-	-	4.0

Calcium, Ca++	mg/l	IS:3025 (Part-40)	75	200	80
Magnesium, Mg++	mg/l	IS:3025 (Part-46)	30	100	34
Total Hardness	mg CaCO3 /l	IS:3025 (Part-21)	300	600	340
Chloride, Cl -	mg/l	IS:3025 (Part-32)	250	1000	511
Sulphate, SO4--	mg/l	IS:3025 (Part-24)	200	400	290
Nitrate, NO3-	mg/l	IS:3025 (Part-34)	45	No Relaxation	32
Iron. Fe	mg/l	IS:3025 (Part-53)	0.3	No Relaxation	0.01
Fluoride, F	mg/l	IS:3025 (Part-60)	1.0	1.5	0.29

(Refer **Annexure-X** for latest environment monitoring results)

AIR ENVIRONMENT

Sampling Period and Stations

In order to establish the baseline status with respect to ambient air quality, twoair sampling station has been established in the area and in the surrounding. The ambient air quality survey was conducted during August 2017.

Sampling Schedule & Parameters

The study was conducted by M/s R.K. Consultants, Jodhpur. The survey was performed during the 24 hours period of post monsoon season. These samples were analyzed in laboratory by adopting the methods specified in National Ambient Air Quality Standards, The following air pollution parameters were monitored during the sampling periods.

1. $PM_{2.5}$
2. PM_{10}
3. Sulphur Dioxide (SO_2)
4. Oxides of Nitrogen (NOx)

Observations

A summary of the observations made during the air quality survey has been given in **Table** below.

Table A8.4: Summary of Ambient Air Quality, Monitoring Results in the area (in µg/m^3) dated 13.08.2017

PARAMETERS	UNIT	TEST METHOD	RESULT	NAAQS**
Sulphur Dioxide, (SO2)	µg/m3	IS-5182 (Part-2)	4.28	80
Oxides of Nitrogen, (NOx)	µg/m3	IS-5182 (Part-6)	9.20	80
PM10	µg/m3	IS-5182 (Part-23)	68	100
PM2.5	µg/m3	CPCB Guideline	29	60
*Carbon Monoxide (CO)	mg/m3	USEPA Method - 10	Nil	4.0

Table A8.5: Summary of Ambient Air Quality, Monitoring Results in near mine site (in µg/m^3) dated 13.08.2017

PARAMETERS	UNIT	TEST METHOD	RESULT	NAAQS**
Sulphur Dioxide, (SO2)	µg/m3	IS-5182 (Part-2)	4.06	80
Oxides of Nitrogen, (NOx)	µg/m3	IS-5182 (Part-6)	8.92	80
PM10	µg/m3	IS-5182 (Part-23)	66	100
PM2.5	µg/m3	CPCB Guideline	25	60
*Carbon Monoxide (CO)	mg/m3	USEPA Method - 10	Nil	4.0

Table A8.6: Summary of Ambient Air Quality, Monitoring Results at mine site (in µg/m^3) dated 22.08.2017

PARAMETERS	UNIT	TEST METHOD	RESULT	NAAQS**
Sulphur Dioxide, (SO2)	µg/m3	IS-5182 (Part-2)	4.63	80
Oxides of Nitrogen, (NOx)	µg/m3	IS-5182 (Part-6)	9.74	80
PM10	µg/m3	IS-5182 (Part-23)	70	100
PM2.5	µg/m3	CPCB Guideline	32	60
*Carbon Monoxide (CO)	mg/m3	USEPA Method - 10	Nil	4.0

Table A8.7: Summary of Ambient Air Quality, Monitoring Results near mine site (in µg/m^3) dated 22.08.2017

PARAMETERS	UNIT	TEST METHOD	RESULT	NAAQS**
Sulphur Dioxide, (SO2)	µg/m3	IS-5182 (Part-2)	4.82	80
Oxides of Nitrogen, (NOx)	µg/m3	IS-5182 (Part-6)	10.24	80
PM10	µg/m3	IS-5182 (Part-23)	67	100
PM2.5	µg/m3	CPCB Guideline	26	60
*Carbon Monoxide (CO)	mg/m3	USEPA Method – 10	Nil	4.0

(Refer **Annexure-X** for latest environment monitoring reports)

On perusal of the results obtained, it is concluded that the level of air pollutants is within the specified permissible limits.

AMBIENT NOISE LEVEL

The noise level measurements have been made at two locations, one within the area and other at distance within 500m towards SW.

Based on the observations made during the studies, it is concluded that the noise levels observed at both locations are within the limits specified for residential and rural area

category.

Table A8.8: Noise level monitoring results (unit in dB(A)) dated 13.08.2017

S. No.	LOCATION	UNIT	SPL	Leq	
				Day Time	Night Time
1	Toward South East direction at about 1 mtr. Distance from Mine site	dB(A)	-	62.2	33.8
2	Near Mine Site	dB(A)	-	60.7	32.6

Table A8.9: Noise level monitoring results (unit in dB(A)) dated 22.08.2017

S. No.	LOCATION	UNIT	SPL	Leq	
				Day Time	Night Time
1	Toward South East direction at about 1 mtr. Distance from Mine site	dB(A)	-	63.4	34.2
2	Near Mine Site	dB(A)	-	61.7	32.9

(Refer **Annexure-X** for latest environment monitoring reports)

SOIL QUALITY RESULTS

The soil quality analysis has been made at two locations, one within the area and other outside the area.

Based on the observations made during the studies, it is concluded that the soil quality observed at both locations are of saline nature and containing low organic carbon.

Table A8.10: Soil quality monitoring results dated 13.08.2017 at mine site

PARAMETERS	UNIT	TEST METHOD	RESULT
PHYSICAL PARAMETERS :			
pH (1:2.5 – Suspension)	-	IS 2720: PART 26	7.96
Electrical	mS/cm	IS 14767:2000	0.280

Conductivity at 250C (1:2 – Suspension)			
Texture	-	USDA,NRCS 3A1	Sandy Loam
Colour*	-	MUNSELL COLOR CHART	Yellowish Brown
Water Holding Capacity	%	USDA, NRCS 3C1a	40.6
Moisture Content	%	IS 2720: PART 9	1.28
CHEMICAL PARAMETERS : SOLUBLE			
Chloride, Cl-	meq/lit.	USDA, NRCS 6K1a	1.8
Calcium, Ca++	meq/lit.	USDA, NRCS 6N1a	1.6
Magnesium, Mg++	meq/lit.	USDA, NRCS 6OA1	1.3
AVAILABLE NUTRIENT			
Nitrate Nitrogen	meq/l	USDA, NRCS 6M1a	0.241
Phosphorous	mg/kg	USDA, NRCS 4D5	2.8
Potassium	mg/kg	USDA, NRCS 6Q2a	234
Organic Carbon	%	IS 2720: PART 22	0.24

Table A8.11: Soil quality monitoring results dated 13.08.2017 at outside mine site

PARAMETERS	UNIT	TEST METHOD	RESULT
PHYSICAL PARAMETERS :			
pH (1:2.5 – Suspension)	-	IS 2720: PART 26	7.94
Electrical Conductivity at 250C (1:2 – Suspension)	mS/cm	IS 14767:2000	0.320
Texture	-	USDA,NRCS 3A1	Sandy Loam
Colour*	-	MUNSELL COLOR CHART	Yellowish Brown
Water Holding Capacity	%	USDA, NRCS 3C1a	46.5
Moisture Content	%	IS 2720: PART 9	2.27
CHEMICAL PARAMETERS : SOLUBLE			

Chloride, Cl-	meq/lit.	USDA, NRCS 6K1a	2.6
Calcium, Ca++	meq/lit.	USDA, NRCS 6N1a	2.0
Magnesium, Mg++	meq/lit.	USDA, NRCS 6OA1	1.8
AVAILABLE NUTRIENT			
Nitrate Nitrogen	meq/l	USDA, NRCS 6M1a	0.306
Phosphorous	mg/kg	USDA, NRCS 4D5	4.5
Potassium	mg/kg	USDA, NRCS 6Q2a	296
Organic Carbon	%	IS 2720: PART 22	0.45

CLIMATE & METEOROLOGY

Climate

The climate of the Kutch district is semiarid with scanty rainfall and moderate humidity. The coldest month is January and the hottest month is May.

Rainfall

The average annual rainfall is reported as 343 mm, and most of this is received in the months of June and Sept. The variation in the rainfall from year to year is large.

Temperature

Summer season: Temperatures range from a minimum of 22°C and it is known to have gone up to levels of around the 40°C mark.
Winter season: The winter season is from November to March and temperatures range from a minimum of 8°C to above 35°C.

Humidity

The relative humidity is high during the southwest monsoon, being generally over 80%. After the monsoon season, humidity decreases, and during the winter season, the air is fairly dry. However, the relative humidity remains above 50% from March to October.

Wind Speed & Direction

An observation of the evening wind-rose shows that the predominant wind direction is from SW almost throughout the year excluding in the months of November, December and January, when the predominance is from NE. The morning winds are from SW during the period from April to September while it is from NE during November to February. March and October being the changeover months from one direction to diagonally opposite direction. The general wind speed exceeds during the months of May to August.

Wind speed

Wind speed plays a dominant role in the dispersion of air pollutants. The wind speeds were found in the range between 0.5 and 36.3 km/hr, with the average value of 11.42 km/hr. Winds were found usually high.

Forest

There is no forest land in the block area.

Flora

The area is scanty/ sparse vegetation. The natural floral species found in the whole of the study area are representative of the Rann Saline Tropical Thorn Forest. The types of plants/ trees found in the study area are as follows: -

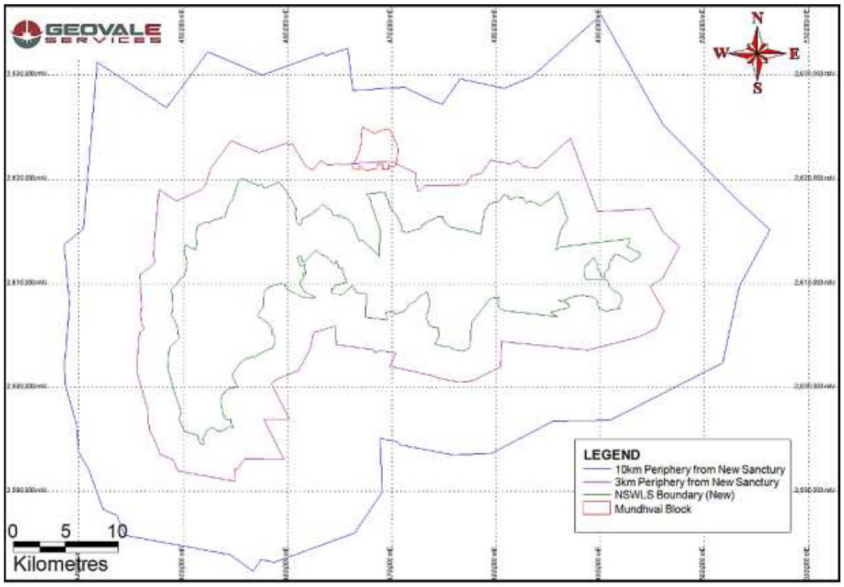
Ganda Baval, Aval, Baval, Gorad, Limdo, Ron, Madith, Miti Jar, Khari Jar, Tal bavdi, Vad, Saru, Pipalo, Khijdo, Gundi, Ambli, Guggul, Kanthorothor, Akado, Moto akado, Kumari, Chenibor, Bordi, Kanthar, Kerdo, Karamdi, Kathgundi, Rambaval, Khipp, Bekara, Undhanphuli, Jinjru, Kulnnphul, BhiyaRingani, Darudi, Moti Bhonpatri, Ratoliya, Ekalkanto, Patharphod, Baru, Darbha, Dab Saliu, Daro, Gandharu, Lampdu.

The average density of trees in the area excluding grass and bushes is hardly 5-6 per hectare.

	Fauna No wild life of any sort is found within the auctioned area. During field visit The study area being almost barren and devoid of water bodies except various seasonal nalahs resulting in patter of animal distribution not in abundance. The Nilgai or Blue Bull, Indian Fox, Indian Hare (Black naped hare), Striped Hyena, Jackal are the mammals observed.
c)	***Human settlements***
	There are no human settlements in the auctioned deposit area. Thus no resettlement and rehabilitation is proposed. The projected affected people fully compensated by direct negotiation. Only nine villages lie outside the deposit area in all directions which constitutes small size human settlements within 5km radius periphery. These are Khengarpar, Fatehpur, Malda, Bevaya, Mudhvay, Koriyani, Navanagar, SK Varmanagar & Naredi. The population of habitats within 5km radius is around 1400. The villagers are mostly employed in agricultural work. Some people are engaged in other businesses. The relative position of villages is depicted along with population on **Key Plan, Plate No. 2**. The entire study area falls within Kachchh District of Gujarat which is popularly known as one of dry district of the nation.
d)	***Public buildings, places of worship and monuments***
	There are no such places within the core zone or in the surrounding area of tourist or historical importance. There are village temples etc. in the surrounding where people worships. No historic monuments etc. are within the block area as well as in the surrounding 5km radius buffer zone. Fort Lakhpat is at distance about 12km towards NE of the block area. Lakhpat is sparsely populated town and sub-district in Kachchh district located at the mouth of Kori Creek. The town is enclosed by 7km long fort wall of 18thcentury.
e)	**Indicate any sanctuary is located in the vicinity of leasehold**
	Narayan Sarovar Sanctuary is located at south of the block at about 5km. It is also popularly known as Narayan Sarovar Wildlife Sanctuary .It was notified as such in April 1981 and subsequently de-notified in 1995 with reduced area, is a unique eco-system near Narayan Sarovar in the Lakhpat taluka of Kachchh district in the state of Gujarat, India.

The desert forest in this sanctuary is said to be the only one of its kind in India. Located in the arid zone, a part of it is a seasonal wetland. Its biodiversity has some rare animals and birds, and rare flowering plants. Wildlife Institute of India (WII) has identified it as one of the last remaining habitats of the cheetah in India and a possible reintroduction site for the species. The most sighted animal here is the Chinkara, which is currently the flagship species of the sanctuary. The 3 kms buffer zone of Narayan Sarovar Wildlife Sanctuary is 2 kms to the south of the block.

Figure: Narayan Sarovar Wildlife Sanctuary (NSWS) in green polygon and the 3 and 10 kms zone surrounding the NSWS sanctuary.



***8.2 Impact Assessment**: Attach an Environmental Impact Assessment Statement describing the impact of mining and beneficiation on environment on the following:*

i) ***Land area indicating the area likely to be degraded due to quarrying, dumping, roads, workshop, processing plant, tailing pond/dam, township etc.***

Table A8.12: Land Use Pattern after first five years (in ha)

Particulars	Forest Land	Santhni Land	Grazing Land	Govt. waste Land	Others	Total
c) Pits & Quarries	-	14.30	-	15.70	-	30.00
b) Dumps of ore Waste & O.B./ Soil bund	-	9.70	-	28.80	-	2.0+28+5.0+3.5 =38.50
c)Infrastructure, built up area etc.	-	-	-	0.10	-	0.10
d) Haul road/ cart track	-	0.62	-	5.38	-	6.00
e) Water body	-	-	-	-	-	-
f) Others (i) Govt. land (ii)Santhni land	- -	- 82.88	-	94.42 -	-	94.42* 82.88*
Total occupied Area	-	107.50	-	144.40	-	251.90

g) Area reclaimed/ rehabilitated by applicant = nil

h) Area greenbelt/ plantation by applicant = 5.0ha

* excluding plantation proposed

ii) ***Air quality-***

<u>Air Quality</u>

Air or atmosphere pollution is another significant consequence of mining operations. Basically Suspended Particulate Matter (SPM) is the only pollutant inducted into the atmosphere and the mining activities may contribute to the SPM concentration.

Monitoring of Air Quality

For effective control over the quality of air sampling stations has to be established in the mining area, as mentioned in previous paras or in accordance with EIA/EMP study. Samples will be collected periodically and analyzed. An analysis record of the samples will be maintained to ensure that the quality of ambient air is within the permissible limit.

a) Following standards in ambient air quality of mining area shall be achieved

Parameters	Standard for Ambient Air for 24 hours average
PM_{10}	100 ug/M3
$PM_{2.5}$	60 ug/M3
SO_2	80ug/M3
NO_x	80ug/M3

Data on ambient air quality shall be regularly submitted to MoEF, SPCB/ CPCB once in six months or as per norms.

b) Vehicle emission shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicle used in mining operation and in transport of mineral. The vehicles not to be overloaded

c) Fugitive dust emission from all sources shall be controlled regularly. Water spraying on haul roads, loading & unloading and transfer points shall be provided and maintained

d) Persons shall wear protective respiratory devices and they shall be provided adequate training and education on safety and health aspect

e) Use of surface miner only for excavation

f) Stacking of OB/ soil with safety measures

g) Periodic monitoring of air quality

h) Period and regular development of greenbelt/ plantation at suitable places

i) Regular water spraying on belt conveyor

j) Covering of belt conveyor

iii) Water quality

Mitigating Measures to be taken to be get the Water polluted

a) Quality of water to be monitored periodically as per norms prescribed by CPCB and in compliance of MoEF& SPCB.

b) Results of water to be reported to the concerned authorities

	c) Monitoring of water level through piezometers to be installed in block area d) Relevant remedial action to be taken in case of abnormal results e) Sea water encountered, if any shall be transported to the proposed de-salination plant f) Recommendations and mitigating measures shall be implemented in accordance with Hydro-geological Report
iv)	***Noise levels***
	Noise Level The present noise levels as revealed by noise survey conducted at two points in and around the block area, noise levels are within the permissible limit. The noise levels shall be kept as detailed below: - (i) Day time - 75 dBA (ii) Night time - 65 dBA **Mitigating Measures to reduce the level of Noise Level** **a)** Measures shall be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operation of HEMM etc. should be provided with ear plugs/ muffs. **b)** For diesel generator set acoustic enclosure/ acoustic treatment shall be provided and by proper maintenance **c)** The operator's cabin would be safe guarded with proper enclosures to reduce the noise levels **d)** A thick tree belt would be provided in phased manner around the periphery of the mine to attenuate noise **e)** The prime movers/diesel engines would be proper designed and will be properly maintained **f)** Period monitoring of noise level as per norms
v)	***Vibration levels (due to blasting)***
	No blasting is proposed hence no vibration is envisaged.
vi)	***Water regime***
	<u>Underground Drainage</u> As the matter of fact the block area of Mudhvay Limestone Deposit is not part of seasonal or perennial drains. Direct precipitation as well as catchment area water shall be accumulated in pits to be created in the area. As discussed earlier, ground water intersection for which Hydro-geological Study is sought and its recommendations should

	be implemented effectively. Sea water ingress not anticipated till the level reached during the first five years. **Mitigation Measures:** a) Regular monitoring of ground water by established network of Piezometer at suitable locations in and around the project area in consultation with competent authority. The frequency of monitoring shall be four times a year or as per recommendation. Data thus collected shall be sent at regular interval to competent authorities. b) Ground water table to be punctured shall be taken care of recommendations of proposed Hydro-geological study c) Wherever required, bund shall be provided around the working pits d) Sea water collected, if any should be sent to proposed plant for de-salination purpose
vii)	***Acid mine drainage***
	Not applicable
viii)	***Surface subsidence***
	Not applicable
ix)	***Socio-economics***
	Key Fields towards Community Development has to be carried out by the company is detailed below: • Balwadis • Adult Education • Women Empowerment • Agricultural Support • Animal Husbandry • Social Afforestation • Medical Facilities • Education Facilities • Employment to Local inhabitants • Communication & Transport
x)	***Historical monuments etc.***
	As discussed earlier no historic monuments etc. are within the block area as well as in the

	surrounding 5km radius buffer zone. Fort Lakhpat is at distance about 12km which is far away so no impact is anticipated on the same.

8.3 Progressive reclamation Plan:

To mitigate the impacts and ameliorate the condition, describe year wise steps proposed for phased restoration, reclamation of lands already/ to be degraded in respect of following items separately for 5 years period.

8.3.1. Mined-Out Land: Describe the proposals to be implemented for reclamation and rehabilitation of mined-out land including the manner in which the actual site of the pit will be restored for future use. The proposals may be supported with yearly plans and sections depicting yearly progress in the activities for land restoration/ reclamation/ rehabilitation, afforestation etc, called "Reclamation Plan".

Plantation Programme

It is proposed to develop green belt in 7.5m barrier along the lease boundary and nearby office complex within block area. The plantation shall be done at regular interval and in phased manner. 1000 saplings are proposed to be planted every year as far as possible depends the maturity of space. Anticipated survival rate is at 70%. Dead saplings to be replenish every year. By the end of first five years, about 5.0 ha area will cover under greenbelt. The location of proposed greenbelt/ plantation is shown in **Yearwise Working Plan, Plate No. 5 series**. The proposed species of saplings easy to grown in the area as discussed earlier.

Generation of waste and its disposal

The year wise generation of OB, plant waste and removal of soil is summarized in table below: -

Year	*Soil* (in cum)	OB (in cum)	Plant Waste (in cum)
1st	42000	1827264	nil
2nd	26765	1142880	nil
3rd	15738	1540682	46000
4th	-	nil	125000
5th	-	nil	185000
Total	**84503**	**4510826**	**356000**

As OB generation is envisaged so disposal of waste is required. Space for stacking of soil is also not required as soil is proposed to be utilized for greenbelt/plantation along statutory boundary barrier.

OB generated shall be dumped between grid as furnished in table below attaining height of 30m in two terraces of 10m each. Retaining wall shall be constructed along proposed dump towards natural slope of the block area. The dimension of retaining wall is proposed 1.0m * width 0.7m.

Plant waste generated shall be dumped between grid as furnished in table below attaining height of 20m in two terraces of 10m.

Year	Space with height required for plant waste dumping (area in ha *H in m)	Space with height required for OB dumping (area in ha *H in m)
1st	nil	Area 11.0ha of 30m height in two terraces of 10m each
2nd	nil	Area 7.0ha of 30m height in two terraces of 10m each
3rd	Area 1.0ha of 10m height	Area 10.0ha of 30m height in two terraces of 10m each
4th	Area 0.50ha of 20m height in one terrace of 10m	-
5th	Area 2.0ha of 20m height in one terrace of 10m	-
Total at the end of plan period	**Area 3.50ha of 20m height in one terrace of 10m**	**Area 28.0ha of 30m height in two terraces of 10m each**

No space is required under soil stacking as the soil removed is being used simultaneously.

Year	Grid Reference of Proposed OB Dumping area	
	Northing	Easting
1st	2623607 to 2624007	469257 to 469565
2nd	2623607 to 2624255	no extension along this axis
3rd	2623607 to 2624568	no extension along this axis
4th	No additional space is required as no waste generation is there	
5th		

Year	Grid Reference of Proposed Plant Waste Dumping area	
	Northing	Easting
1st	No dumping	
2nd	No dumping	
3rd	2623255 to 2623345	469335 to 469425
4th	no extension along this axis	469425 to 469504
5th	2623345 to 2623470	no extension along this axis

Dump Design:-

- The slope stability of waste rock dumps will be maintained with overall angle of 37° and the side slopes will be 45° from horizontal.
- Terracing at each 10.0m shall be provided of 10m width for easy movement and safety of dump.
- Garland drain shall be constructed, if required to check siltation around dumps.
- Settling tanks will be constructed at suitable places from where silt deposit will be collected.
- Run-off water is clean and used for mining activities.

8.3.2 Topsoil Management: The topsoil available at the site and its utilization may be described.

The removal of soil and its disposal have already been discussed in previous paras. Whatsoever soil encountered shall be utilized for greenbelt/ plantation purpose simultaneously within the block area. Greenbelt/ plantation is proposed along boundary barrier.

8.3.3 Tailings Dam Management: The steps to be taken for protection and stability of tailing dam, stabilization of tailing material and its utilization, periodic desilting measures to prevent water pollution from tailings etc, arrangement for surplus water overflow along with detail design, structural stability studies, the embankment seepage loss into the receiving environment and ground water contaminant if any may be described.

Not applicable

8.3.4 Acid mine drainage, if any and its mitigative measures.

Not applicable

8.3.5 Surface subsidence mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism.

The information on protective measures for reclamation and rehabilitation works year wise may be provided as per the following table.

First Year

Items	***Details***	***Proposed***	***Actual***	***Remark***
Dump management	*Area afforested (ha)*	No proposal	-	Temporarily creation of dump so no proposal of stabilization is required
	No. of saplings planted	None	-	-
	Cumulative no of plants	None	-	-
	Cost including watch and care during the year	None	-	-
Management of worked out benches	*Area available for rehabilitation (ha)*	-	-	-
	Afforestation done (ha)	-	-	
	No. of saplings planted in the year	-	-	-
	Cumulative no of plants	-	-	-
	Any other method of rehabilitation (specify)	No proposal	-	Working is continuous process
	Cost including watch and care during the year	None	-	-
Reclamation and Rehabilitation by backfilling	*Void available for Backfilling (L x B x D) pitwise /stope wise*	No proposals	None	Backfilling is not envisaged for want of matured area
	Void filled by waste /tailings	None	-	-
	Afforestaion on the backfilled area	None	-	-
	Rehabilitation by making water reservoir	None	-	-
	Any other means (specify)	None	-	-
Rehabilitation of waste land within lease	*Area available (ha)*	No proposal	-	-
	Area rehabilitated	None	-	-
	Method of rehabilitation	None	-	-
Others	Plantation			
	Afforestation to be done (ha)	1.00	None	Along statutory barrier of boundary pillar no. 'C-07 to C-

				06.
	No. of saplings planted in the year	1000	None	Suitable local saplings
	Fencing (m)	1200	None	Fencing is proposed all around the plantation
	Retaining wall (m)	780	-	Against the natural slope of the dumped area i.e. grid: - N-S 2623607 to 2624007 E-W 469228 to 469266

Second Year

Items	***Details***	***Proposed***	***Actual***	***Remark***
Dump management	*Area afforested (ha)*	No proposal	-	Temporarily creation of dump so no proposal of stabilization is required
	No. of saplings planted	None	-	-
	Cumulative no of plants	None	-	-
	Cost including watch and care during the year	None	-	-
Management of worked out benches	*Area available for rehabilitation (ha)*	-	-	-
	Afforestation done (ha)	-	-	
	No. of saplings planted in the year	-	-	-
	Cumulative no of plants	-	-	-
	Any other method of rehabilitation (specify)	No proposal	-	Working is continuous process
	Cost including watch and care during the year	None	-	-
Reclamation and Rehabilitation by backfilling	*Void available for Backfilling (L x B x D) pit wise / stope wise*	No proposals	None	Backfilling is not envisaged for want of matured area
	Void filled by waste / tailings	None	-	-
	Afforestaion on the backfilled area	None	-	-
	Rehabilitation by making water	None	-	-

	reservoir			
	Any other means (specify)	None	-	-
Rehabilitation of waste land within lease	*Area available (ha)*	No proposal	-	-
	Area rehabilitated	None	-	-
	Method of rehabilitation	None	-	-
Others	Plantation			
	Afforestation to be done (ha)	1.00	None	Along statutory barrier of boundary pillar no. 'C-06 and till middle of C-05 & C-04.
	No. of saplings planted in the year	1000	None	Suitable local saplings
	Fencing (m)	1200	None	Fencing is proposed all around the plantation
	Retaining wall (m)	215	-	Against the natural slope of the dumped area i.e. grid: - N-S 2624007 to 2624255 E-W 469228 to 469266

Third Year

Items	***Details***	***Proposed***	***Actual***	***Remark***
Dump management	*Area afforested (ha)*	No proposal	-	Temporarily creation of dump so no proposal of stabilization is required
	No. of saplings planted	None	-	-
	Cumulative no of plants	None	-	-
	Cost including watch and care during the year	None	-	-
Management of worked out benches	*Area available for rehabilitation (ha)*	-	-	-
	Afforestation done (ha)	-	-	
	No. of saplings planted in the year	-	-	-
	Cumulative no of plants	-	-	-
	Any other method of	No proposal	-	Working is

	rehabilitation (specify)			continuous process
	Cost including watch and care during the year	None	-	-
Reclamation and Rehabilitation by backfilling	*Void available for Backfilling (L x B x D) pit wise /stope wise*	No proposals	None	Backfilling is not envisaged for want of matured area
	Void filled by waste /tailings	None	-	-
	Afforestaion on the backfilled area	None	-	-
	Rehabilitation by making water reservoir	None	-	-
	Any other means (specify)	None	-	-
Rehabilitation of waste land within lease	*Area available (ha)*	No proposal	-	-
	Area rehabilitated	None	-	-
	Method of rehabilitation	None	-	-
Others	Plantation			
	Afforestation to be done (ha)	1.00	None	Along statutory barrier of boundary pillar no. 'C-07 and C-01.
	No. of saplings planted in the year	1000	None	Suitable local saplings
	Fencing (m)	1354	None	Fencing is proposed all around the plantation
	Retaining wall (m)	318	-	Against the natural slope of the dumped area i.e. grid: - N-S 2624255 to 2624652 E-W 469228 to 469266

Fourth Year

Items	***Details***	***Proposed***	***Actual***	***Remark***
Dump management	*Area afforested (ha)*	No proposal	-	Temporarily creation of dump so no proposal of stabilization is required

	No. of saplings planted	None	-	-
	Cumulative no of plants	None	-	-
	Cost including watch and care during the year	None	-	-
Management of worked out benches	*Area available for rehabilitation (ha)*	-	-	-
	Afforestation done (ha)	-	-	
	No. of saplings planted in the year	-	-	-
	Cumulative no of plants	-	-	-
	Any other method of rehabilitation (specify)	No proposal	-	Working is continuous process
	Cost including watch and care during the year	None	-	-
Reclamation and Rehabilitation by backfilling	*Void available for Backfilling (L x B x D) pit wise / stope wise*	No proposals	None	Backfilling is not envisaged for want of matured area
	Void filled by waste / tailings	None	-	-
	Afforestaion on the backfilled area	None	-	-
	Rehabilitation by making water reservoir	None	-	-
	Any other means (specify)	None	-	-
Rehabilitation of waste land within lease	*Area available (ha)*	No proposal	-	-
	Area rehabilitated	None	-	-
	Method of rehabilitation	None	-	-
Others	Plantation			
	Afforestation to be done (ha)	1.00	None	Along statutory barrier of boundary pillar no. 'C-01to C-04.
	No. of saplings planted in the year	1000	None	Suitable local saplings
	Fencing (m)	1255	None	Fencing is proposed all around the plantation
	Retaining wall (m)	-	-	-

Fifth Year

Items	***Details***	***Proposed***	***Actual***	***Remark***
Dump management	*Area afforested (ha)*	No proposal	-	Temporarily creation of

				dump so no proposal of stabilization is required
	No. of saplings planted	None	-	-
	Cumulative no of plants	None	-	-
	Cost including watch and care during the year	None	-	-
Management of worked out benches	*Area available for rehabilitation (ha)*	-	-	-
	Afforestation done (ha)	-	-	
	No. of saplings planted in the year	-	-	-
	Cumulative no of plants	-	-	-
	Any other method of rehabilitation (specify)	No proposal	-	Working is continuous process
	Cost including watch and care during the year	None	-	-
Reclamation and Rehabilitation by backfilling	*Void available for Backfilling (L x B x D) pit wise /stope wise*	No proposals	None	Backfilling is not envisaged for want of matured area
	Void filled by waste /tailings	None	-	-
	Afforestaion on the backfilled area	None	-	-
	Rehabilitation by making water reservoir	None	-	-
	Any other means (specify)	None	-	-
Rehabilitation of waste land within lease	*Area available (ha)*	No proposal	-	-
	Area rehabilitated	None	-	-
	Method of rehabilitation	None	-	-
Others	Plantation			
	Afforestation to be done (ha)	1.00	None	Along statutory barrier at remaining places.
	No. of saplings planted in the year	1000	None	Suitable local saplings
	Fencing (m)	200	None	Fencing is proposed all around the plantation
	Retaining wall (m)	-	-	-

To evaluate the effectiveness of environmental management programme regular monitoring of the important environmental parameters will be taken up.

A team of qualified and trained personnel shall be engaged to carry out the task and be responsible for the following:

Collecting water and air samples, work zone monitoring for air pollutants.

[1] Analyzing the water and air samples

[2] Implementing the control and protective measures

[3] Coordinating the environment related activities within the mine

[4] Green belt development etc.

[5] Monitoring the progress of implementation of environmental management programme

[6] An area where employment opportunities presently are limited. With mining activities, local people will have a lot of direct and indirect employment avenues opened up due to enhancement in production. Hence, enhancement in mining activities will have a beneficial effect on socio economic condition with schools, hospital and markets coming up in otherwise almost barren area.

[7] Good housekeeping will improve the working conditions.

[8] Regular cleaning of roads to avoid accumulation of dust/ water.

[9] Regular cleaning/ washing of shop floors.

[10] Maintaining development of greenbelt around the mining site, the plantation of trees are not only for the suppression of dust and pollutant transportation but it is also for enhancing the aesthetic values.

[11] Avoiding un-necessary accumulation and dumping of waste and damaged equipment.

[12] Maintaining hygienic condition in the canteen, drinking water sources and toilets.

[13] Occupational safety and health is another important factor in the mining area and following steps are to be taken.

[i] Audio visual dissemination of information on safety, embracing risks associated with their profession, safety regulation will be adopted meticulously

[ii] Organization of safety weeks.

[iii] Seminars/ workshops related to industrial safety.

[iv] Mandatory use of personal safety equipment like helmets, goggles, gloves, masks muffs etc. wherever required.

[14] Non-destructive testing of all equipment and machinery will be carried out at regular

intervals.

8.4 Disaster Management and Risk Assessment: This may deal with action plan for high risk accidents like landslides, subsidence flood, inundation in underground mines, fire, seismic activities, tailing dam failure etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such eventualities and the assistance to be required from the local authority may also be described.

As the area is close to coast there are chances of hitting of cyclone which may cause:

[1] Flash floods

[2] Damage of life and property

[3] Disruption of road & telecommunication facilities.

[4] Lightning

The following points will be followed in this Progressive Mine Closure Plan for disaster management:

[1] Working of mine as per approval.

[2] Working as per applicable Rules & Regulations

[3] Responsibilities from top to bottom line in case of high-risk accidents have been well defined.

[4] Action plan has been made for quick evacuation in case of high-risk accident and natural disaster.

The area falls in the seismic active zone-V which is high seismic zone hence precaution taken for earthquake: -

a. Before an Earthquake

1. All the civil construction is proposed to be carried out with design which will be able to withstanding seismic activities.

2. A fire extinguisher, first aid kit, a battery-powered radio, a flashlight, and extra batteries at site.

3. Not to be leave heavy objects on shelves.

4. Anchoring of heavy furniture, cupboards, and appliances to the walls or floor.

b. During an Earthquake

1. Stay calm! If anybody indoors, stay inside and if outside, stay outside.

2. If anybody indoors, to be stand against a wall near the centre of the building, stand in a doorway, or crawl under heavy furniture (a desk or table). Stay away from windows and outside doors.

3. If anybody outdoors, stay in the open away from power lines or anything that might fall. Stay away from buildings (stuff might fall off the building or the building could fall on you).
4. Not to be use matches, candles, or any flame.
5. If anybody is in a vehicle, stop the vehicle and stay inside the vehicle until the earthquake stops.

The complete mining operation will be carried under the Management and control of experienced and qualified Mines Manager having Certificate of Competency to manage the mines, granted by DGMS. Standing orders and circulars issued by DGMS shall be followed by the mine management in case of disaster, if any.
To avoid any fire hazard all heavy earth moving equipment shall be provided with fire fighting equipment. Personnel shall be given proper training in fire fighting and mock rehearsals conducted.
However to meet any emergency a Disaster Management Plan shall be prepared widely circulated and training through rehearsals and mock drills shall be done.
The objective of the Disaster Management Plan is to make use of the combined resources of the mines and outside services to achieve the following:-

- Effect the rescue and medical treatment of casualties
- Safeguard other people
- Minimize damage to property and the environment
- Initially contain and ultimately bring the incidence under control
- Identify any dead
- Provide authoritative information to the News media
- Secure the safe rehabilitation of affected area

The mineral from the deposit area shall be utilized for manufacturing of cement in the proposed cement plant in the vicinity. The following facilities are to be provided at the proposed plant/ colony and same shall be available for mine as well.

1. Fire fighting station with fire fighting trucks and staff
2. Well equipped hospital
3. Ambulance

The applicant with own facilities will be capable of handling any emergency however, in case of any need, help of Administrative, Govt. Hospital and police from district town can

be taken. A senior most executive will be heading the emergency organization. He will work as site controller. Mine Manager will work as incident controller to organize the team for controlling the incident with the person under his control.

EMERGENCY RESPONDING TEAM			
Sr. No.	**Particular**	**Name**	**Address & Phone no.**
1.	Controller	Mines Manager	M/s Adani Cementation Ltd. Bhanu Prakash Bhatanagar Head of Mining Activities Contact No. +91 90999 91028
2.	Site Controller	Shift In charge/ Asst. Manager	
3.	Communication In charge	Security In charge	
4.	Safety & Health	Medical In charge	

8.5 Care and maintenance during temporary discontinuance: An emergency plan for the situation of temporary discontinuance due to court order or due to statutory requirements or any other unforeseen circumstances may indicate measures of care, maintenance and monitoring of status of discontinued mining operations expected to re-open in near future.

In case of any temporary discontinuance due to court order or due to statutory requirement or any other unforeseen circumstance following measures for care and maintenance and monitoring of status shall be taken.

- Notice of temporary discontinuance of work in mine shall be given in case the discontinuance exceeds six days to the Controller General Controller of Mine and the Regional Controller, IBM and DGMS Officials.
- All the mining machinery shall be shifted to a safe place.
- Entrance to the mines or part of the mines to be discontinued shall be fenced off and security guards shall be posted for the safety and to restrict any unauthorized entry to the area.
- Competent persons shall inspect the area regularly.
- Air, water and other environmental monitoring shall be carried out.
- Care and upkeep of plantation done shall be carried out on regular basis.

- Status of the working and status monitoring for re-opening of the mines shall be discussed in weekly meeting on last working day of the week.

In case of discontinuance due to any natural calamities mining operation will be restarted as early as possible after completing rescue work, restoring safety and security and repairs of roads.

8.6 Financial Assurance:-

The financial assurance can be submitted in any en-cashable form preferably a Bank Guarantee from a Scheduled Bank as stated in Rule 27 of Mineral conservation and Development Rules, 2017 for five years period expiring at the end of validity of the document. The amount calculated for the purpose of Financial Assurance is based on the CCOM's Circular no. 04 dated 2006 as below.

Table indicating the break-up of areas in the Mining Lease for calculation of Financial Assurance

S. No.	*Items*	*Area put to use at start of scheme of mining (ha)*	*Additional requirement during plan period (ha)*	*Total area (ha)*	*Area considered as fully reclaimed & rehabilitated ha*	*Net area considered for calculation ha*
1.	*Area under mining*	-	30.00	30.00	-	30.00
2.	*Storage for soil & soil bund*	-	5.00	5.00	-	5.00
3.	*OB &Waste dump site*	-	31.50	31.50	-	31.50
4.	*Mineral storage*	-	2.00	2.00	-	2.00
5.	*Infrastructures*	-	*0.10*	*0.10*	-	*0.10*
6.	*Roads*	1.50	4.500	6.00	-	6.00
7.	*Railways*	-	-	-	-	-
8.	*Tailing pond*	-	-	-	-	-
9.	*Effluent Treatment Plant*	-	-	-	-	-
10.	*Mineral Separation Plant*	-	-	-	-	-
11.	*Township area*	-	-	-	-	-
12.	*Others (specify)*	-	-	-	-	-
	Grand Total	**1.50**	**73.10**	**74.60**	**-**	**74.60**

Under Rule 27 of MCDR'2017, the area put to use for mining & allied activities will be 74.60ha at the end of five years of Progressive Mine Closure Plan. It amounts to a sum of Rs. 2,23,80,000/- @ Rs. 3,00,000/- per hectare. But the deposition of financial assurance so calculated is need not required in this case. As per the provisions of sub-rule (1) of rule 27 of MCDR, 2017, financial assurance is not applicable in the case as the mining lease shall be granted through the Mine Development and Production Agreement (MDPA) which is to be signed between the State Government and applicant along with requisite Performance security.

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PART B

1.0 Certificates/ Undertakings/ Consents

Certificates/ undertaking/ consents have been enclosed with this report.

(Rakesh Purohit) (S.K. Soni)

Date : (Mining Engineer) (Mining Geologist)

Place : Jodhpur

---------- END OF REPORT ----------