MINING PLAN
Under Rule – 24(A) of MCR – 1960
&
PROGRESSIVE MINE CLOSURE PLAN
Under Rule 23B(3) of MCDR – 198
FOR
KRISHNA MINES (Rc.No8480/MM4/2002)

EXTENT - 31.092 Ha

Village – Ramayanpatti

Taluk & District - Tirunelveli

Registration number under Rule – 45 - IBM/5567/2011

Mineral - Limestone

Type of Land – Revenue

Category of Mine – A Category(Fully Mechanised)

Mine Plan Period – 2012 -13(From 28.1.13) to 2017-18

LESSEE

Krishna Mines

23, Sripuram, Tirunelveli

Tamilnadu.

Ph – 0462 – 233200

Prepared by
M.S. Jayaram
RQP/MAS/173/2003/A Valid upto 09.07.2023

PLATES

MINING PLAN
Under Rule – 24(A) of MCR – 1960
&
PROGRESSIVE MINE CLOSURE PLAN
Under Rule 23B(3) of MCDR – 198
FOR
KRISHNA MINES (Rc.No8480/MM4/2002)

EXTENT - 31.092 Ha

Village – Ramayanpatti

Taluk & District - Tirunelveli

Registration number under Rule – 45 - IBM/5567/2011

Mineral - Limestone

Type of Land – Revenue

Category of Mine – A Category(Fully Mechanised)

Mine Plan Period – 2012 -13(From 28.1.13) to 2017-18

LESSEE

Krishna Mines

23, Sripuram, Tirunelveli

Tamilnadu.

Ph – 0462 – 233200

Prepared by
M.S. Jayaram
RQP/MAS/173/2003/A Valid upto 09.07.2023

LIST OF ANNEXURES

S. NO	DESCRIPTION	ANNEXURE
1	Lease Deed	Annexure – 1
2	Renewal Application	Annexure – 2
3	Form 'D' Acknowledgement for Renewal Application	Annexure – 2A
4	Prospecting License Application	Annexure – 3
5	Scheme of Mining Approval Letter.	Annexure – 4
6	Partnership Deed	Annexure – 5
7	Copy of Registration of Company	Annexure – 6
8	Photo ID of Authorised Signatory	Annexure – 7
9	RQP Certificate	Annexure – 8
10	Bore Hole Logs	Annexure – 9
11	Feasibility Report	Annexure – 10
12	NABL Analysis	Annexure – 11
13	Ambient Air Quality Data	Annexure – 12
14	Noise Quality Data	Annexure – 13
15	Water Quality Data	Annexure – 14
16	General Power of Attorney	Annexure – 15
17	Common working boundary permission letter	Annexure – 16
18	Bank Guarantee	Annexure – 17

LIST OF PLATES

S.NO	PLATE NO	DETAILS	SCALE
1	PLATE – 1	Key Plan	1:50000
2	PLATE – 1A	Location Plan	1:64000
3	PLATE- 2	Lease sketch	1 : 5000
4	PLATE- 3	Surface Plan	1:2000
5	PLATE- 4	Geological Plan	1:2000
6	PLATE- 5	Geological Cross section	1:2000
7	PLATE- 5A	Longitudinal Sections.	1:2000
8	PLATE- 6A	Production and Development at the end of 2013-14 year	1:2000
9	PLATE- 6B	Production and Development at the end of 2014-15 year	1:2000
10	PLATE - 6C	Production and Development at the end of 2015 -16 year	1:2000
11	PLATE - 6D	Production and Development at the end of 2016 -17 year	1:2000
12	PLATE – 6E	Production and Development at the end of 2017 – 18 year	1:2000
13	PLATE - 7	Yearwise Cross Sections	1:2000
14	PLATE – 8	Conceptual Plan	1:2000
15	PLATE - 9	Conceptual Cross Sections	1:2000
16	PLATE – 10	Environmental Plan	1:5000
17	PLATE – 11	Progressive Mine Closure Plan	1:2000
18	PLATE – 12	Environment Management Plan	1:2000

CONTENTS

TABLES

MINING PLAN FOR KRISHNA MINES – FOR RC NO 8480/MM4/2002 (G.O.M.S. NO 1081 - OLD) OVER AN EXTENT OF 31.092 HA IN RAMAYANPATTI VILLAGE TIRUNELVELI TALUK & DISTRICT, TAMILNADU.

Submitted under Rule – 24(A) of MCR - 1960

Introduction

Krishna Mines is situated in Ramayanpatti village in Tirunelveli Taluk and District in Tamil Nadu. This mine is supplying a major portion of their limestone production to M/S. The India Cements Limited, Sankar Nagar for their modernized dry process cement plant.

The mining Lease is covered under G.O.M.S. 1081-old dated 2-9-1983 was originally granted vide G.O.M.S. 2557 dated 10-5-1962 for a period of 20 years from the date of execution of the Lease deed on 28-1-1963 and the lease expired on 27-1-83. When the application was filed for their first renewal, the same was granted only for six years. The applicant appealed through revision application to the central government requesting the lease period to be extended for twenty years. Finally the Government of Tamil Nadu, after obtaining the final order from Central government, extended the mining lease period to twenty years from 28-01-1983 which got expired on 27-1-2003.

After that the applicant has also submitted an application for second renewal, dated on 23-1-2002 for which mining plan was prepared and got approved vide No TN/TNL/MP/CST/1452/2 dated 19-12-02 up to 2007-08. Subsequently the mine plan was modified to capitalize on the good market existing for high magnesium limestone and the modified mine plan was approved vide Lr.No TN/TNL/MP/CST/1610/SZ dated 12.08.2005.

Details of the lease is given under **Table No- 1**

Details of the lease **Table No- 1**

S.No	G.O.Ms.No & Date	Extent (Ha.)	Villages	Period of lease
1)	G.O.Ms.No – 1081 Dated 02.09.1983	31.092	Ramayanpatti	20 years
2)	Rc.No8480/MM4/2002	31.092	Ramayanpatti	10 years Valid upto 27.01.2013

- The **G.O.Ms.No – 1081** was applied for renewal letter dated 23.01.2002.
- The Second renewal was granted vide letter Rc.No.8480/MM4/2002 dated 11.06.04 with effect from 28.01.2003 to 27.01.2013 valid for 10 years only.
- The lease deed has been executed.
- Although the lessee wanted renewal for 20 years lease renewal was granted for 10 years only. Copy of Mine lease deed is enclosed Vide **Annexure – 1.**
- Hence the lessee has applied for renewal of the lease on M2/3239/2012 dated 24.01.2012. Copy of the renewal application and its acknowledgement are enclosed vide **Annexure – 2 & 2A.**

The lessee is holding one more lease only in the state of Tamilnadu. The details are given below in **Table No- 2**

Details of the lease held by the lessee **Table No- 2**

Sl.no.	Lease no. & date	Area (Ha)	Postal address / location	Type of minerals	Remarks
1	**G.O.M.S.NO.48 (OLD) / 115**	12.12	Krishna Mines 23, Sripuram, Tirunelveli Tamil Nadu. Pin Code : 627 001 Ph :0462– 233200 Fax:-0462 – 2339248	Limestone	

Besides the lessee has applied for prospecting license over an extent of 31.97 Ha (Patta Lands) on 18.01.2013 (Refer **Annexure- 3).**

Submission of Mining plan

The existing scheme of mining is for the period 2008-2013 valid up to 27.01.2013. The Scheme of mining was approved vide letter No TN/TNL/ LST/MS-602-SZ dated 31.01.12 **(Annexure – 4)**

Since the lessee has applied for renewal of the lease a fresh mining plan is being prepared and submitted under Rule 24(A)of MCR - 1960.

Review of important chapters of the approved Scheme of Mining:

i) Exploration

Proposed :- 14 Holes were proposed in the previous scheme period.

Actual: - Further it was programmed to drill 14 bore holes during the year 2012-13 (5 holes during the previous scheme period) and 2013-14 (9 holes during the first year of the present scheme period. However the 5 bore holes planned during the last year of the previous scheme period could not be completed and the same will be completed along with 9 holes during the present scheme period. The details of exploration program is given in **Table No- 3**

Exploration programme actual versus achieved **Table No- 3**

Year	Bore Hole Id	Location	Proposed metreage	Actual achieved	Remarks
2013 - 14	PBH - 1	N – 450, E – 50	40 m	Nil	5 bore holes planned during the last year of the previous scheme period could not be completed and the same will be completed along with 9 holes during the present scheme period
2013 - 14	PBH - 2	N – 450, E – 150	40 m	Nil	
2013 - 14	PBH – 3	N – 450, E – 250	40 m	Nil	
2013 - 14	PBH – 4	N – 550, E – 150	40 m	Nil	
2013 - 14	PBH - 5	N – 550, E – 250	40 m	Nil	
2014 - 15	PBH – 6	N – 150, E – 150	40 m	Nil	
2014 - 15	PBH – 7	N – 250, E – 50	40 m	Nil	
2014 - 15	PBH – 8	N – 250, E – 150	40 m	Nil	
2014 - 15	PBH – 9	N – 250, E – 250	40 m	Nil	
2014 - 15	PBH – 10	N – 350, E – 50	40 m	Nil	
2014 - 15	PBH – 11	N – 350, E – 150	40 m	Nil	
2014 - 15	PBH – 12	N -130, E - 0	40 m	Nil	
2014 - 15	PBH – 13	N -85, E - 60	40 m	Nil	
2014 - 15	PBH - 14	N - 85, E - 160	40 m	Nil	
			560 m		

ii) Waste disposal

Details of waste disposal proposed versus actual achieved is given in **Table No- 4**

Table No- 4

Year	Waste Disposal Planned as per approved Mining Plan (Tonnes)	Actual (Tonnes)	Reasons for deviation
2008-09	-	872878	Scheme of mining was submitted only for the last 2 years after violation was issued by IBM. Hence the proposed development quantity for 2008-09 to 2010-11 is left blank, whereas the actual achieved is given against actual column.
2009-10	-	1885672	
2010-11	-	1743472	
2011-12	58785	1524338	Additional development was done for removal of the waste dump on the North western side of the lease as per the DDMS violation letter. CR/Limestone/GI/VL/2017 dated 06.09.2012.
2012-13	99154	570772	
TOTAL	**157939**	6597132	

Reason for additional handling: During the plan period it was propose to handle 0.157 Mil.T whereas the actual handling is 2.09 Mil.T. Additional development was done for removal of the waste dump on the North western side of the lease as per the DDMS violation letter. CR/Limestone/GI/VL/2017 dated 06.09.2012..

iii) Production

Details of production proposed versus actual achieved is given in **Table No- 5**

Table No- 5

Year	Production Planned + Sub grade dump working (Tonnes)	Actual Production (Tonnes)	Reasons for deviation
2008-09	-	291521	Scheme of mining was submitted only for the last 2 years after violation was issued by IBM. Hence the proposed production quantity for 2008-09 to 2010-11 is left blank, whereas the actual achieved is given against actual column
2009-10	-	289999	
2010-11	-	229996	
2011-12	332714	370918	As the limestone intake of India cements was more the lessee exceeded the production. The increase in production was necessitated as the Limestone intake from Koodangulam mines decreased. Krishna mines was operating a hydrated lime unit which has expanded necessitating increase in production of magnesian limestone to the unit.
2012-13	400032	370935	The production is within the targeted quantity.

Note: The production carried out during 2008-09, 2009-10 & 2010-11 is 291521 T, 289999 T & 229996 T respectively.

Justification for the deviation:-

Out of the targeted production of 732746 T during 2011-12 & 2012-13 as per the approved Scheme of Mining the actual production was 741853 T.

In the fourth year of the scheme period the production was more than the planed quantity as intake of India cements plant was more. The increase in production was necessitated as the India Cements limestone intake from Koodangulam mines decreased.

Krishna mines was operating a hydrated lime unit which has expanded necessitating increase in production of magnesian limestone to the unit.

iv) <u>Location wise afforestation</u>

Details of afforestation proposed versus actual achieved is given in **Table No- 6**

Table No- 6

Year	Area in Ha.	Afforestation Planned as per approval	Extent of Actual plantation (In Ha)	Location	Actual plantation	Remarks
2008-09	Nil	Nil	0.15	On the southern side of the lease and on the Dump in the Northwestern side	350	
2009-10	Nil	Nil	0.35		750	
2010-11	Nil	Nil	0.35		650	
2011-12	0.20	500	0.20		500	
2012-13	0.20	500	0.15		375	
TOTAL	Nil	Nil	**1.20**		**2625**	

CHAPTER –1

1.0 General

1.GENERAL	
a) Name of the applicant	M/s **Krishna Mines**
Address	23, Sripuram
District	Tirunelveli
State	Tamilnadu
Pin Code	627 001
Phone	2333200 (STD Code 0462)
Fax	2339248 (STD Code 0462)
e-mail	Krishnamines@sancharnet.in
b) Status of the applicant	Partnership firm Mr.Vinayak Shankar has been made Partnership deed holder residing in the below mentioned address. Mr.Vinayak Shankar "Farm House", 187 Sankarankoil Road, Ramayanpatti, Tirunelveli - 627358 Copy of Partnership deed is enclosed as **Annexure - 5** Copy of the Registration of the Company and Photo ID of Authorised signatory are enclosed as **Annexure – 6 & 7**.
c) Mineral(s) which are occuring in the area and which the applicant intends to mine	Limestone
d)Period for which the mining lease is granted / renewed / proposed to be applied	G.O.Ms.No & Date / Extent (Ha.) / Villages / Period of lease G.O.Ms.No – 1081 Dated 02.09.1983 / 31.092 / Ramayanpatti / 20 years Rc.No8480/MM4/2002 / 31.092 / Ramayanpatti / 10 years Valid upto 27.01.2013 The lessee has applied of renewal of the lease on M2/3239/2012 dated 24.01.2012 for a further period of 20 years. Copy of renewal application and form – D received from Collector's office is enclosed vide **Annexure 2 & 2A.**

e) Name of the RQP preparing the mining plan	M.S.Jayaram
Address	New No – 49, Old No – 23 Umapathy Street West Mambalam Chennai – 600 033.
Phone	Phone - 044 – 24722195, Mobile - 9952961106
Fax	Nil
e-mail	empres05@rediffmail.com
Telex	Nil
Registration No.	RQP/MAS/173/2003/A (Refer **Annexure – 8** for RQP certificate)
Date of grant	10.07.2003
Valid upto	09.07.2013
f) Name of the prospecting agency	Krishna Mines
Address	Address : 23, Sripuram : Tirunelveli. State : Tamilnadu Pin code : 627001
Phone	2333200 (STD Code 0462)
Fax	2339248 (STD Code 0462)
g) Reference no. and date of consent letter from the State Govt.	Second renewal was granted vide letter Rc.No.8480/MM4/2002 dated 11.06.04 with effect from 28.01.2003 to 27.01.2013 valid for 10 years

CHAPTER – 2

2.0 Location and Accessibility

<table>
<tr><td colspan="3">a) Details of the area (with location Plan)</td></tr>
<tr><td>i)</td><td>District and State</td><td>Tirunelveli District in the state of Tamil Nadu</td></tr>
<tr><td>ii)</td><td>Taluk</td><td>Tirunelveli</td></tr>
<tr><td>iii)</td><td>Village</td><td>Ramayanpatti</td></tr>
<tr><td>iv)</td><td>Khasra No./ Plot No</td><td>S.F.Nos -
767,768,769,770,771,772,773,774,775,776,777,778,
779,780, 781,782,783,784,785,786,787,788,789,790,791/2
<table>
<tr><th colspan="4">DETAILS OF THE GROUND CONTROL POINTS</th></tr>
<tr><th>Sl.No</th><th>Distance</th><th>Bearing From North</th><th>LATITUDE & LONGITUDE</th></tr>
<tr><td colspan="3">GCP I - OLD OFFICE ROOM</td><td>N - 8°47'41",
E - 77°41'10"</td></tr>
<tr><td>A</td><td>632 M</td><td>4° 45' 58"</td><td></td></tr>
<tr><td>B</td><td>225 M</td><td>16° 57' 11"</td><td></td></tr>
<tr><td>C</td><td>31 M</td><td>158° 23' 46"</td><td></td></tr>
<tr><td colspan="3">GCP II - ANFO MIXING SHED</td><td>N - 8°47'42",
E - 77°40'22"</td></tr>
<tr><td>C</td><td>377 M</td><td>262° 26' 52"</td><td></td></tr>
<tr><td>D</td><td>249 M</td><td>107° 18' 45"</td><td></td></tr>
<tr><td>F</td><td>401 M</td><td>53° 26' 20"</td><td></td></tr>
<tr><td colspan="3">GCP III - SURVEY PILLAR</td><td>N - 8°47'40",
E - 77°40'28"</td></tr>
<tr><td>D</td><td>21 M</td><td>151° 26' 53"</td><td></td></tr>
<tr><td>E</td><td>107 M</td><td>92° 12' 57"</td><td></td></tr>
<tr><td>F</td><td>309 M</td><td>17° 55' 10"</td><td></td></tr>
<tr><td colspan="3">GCP IV - NEW WEIGH BRIDGE</td><td>N - 8°47'40.5",
E - 77°40'32.4"</td></tr>
<tr><td>E</td><td>41 M</td><td>142° 07' 38"</td><td></td></tr>
<tr><td>F</td><td>267 M</td><td>2° 50' 56"</td><td></td></tr>
<tr><td colspan="3">GCP V - MAGAZINE</td><td>N - 8°47'56",
E - 77°40'32.2"</td></tr>
<tr><td>G</td><td>205 M</td><td>195° 38' 03"</td><td rowspan="4"></td></tr>
<tr><td>H</td><td>424 M</td><td>247° 37' 07"</td></tr>
<tr><td>I</td><td>344 M</td><td>297° 08' 51"</td></tr>
<tr><td>J</td><td>151 M</td><td>39° 05' 02"</td></tr>
</table></td></tr>
<tr><td>v)</td><td>Lease area</td><td>31.092 Ha of patta land.
Refer Plate No.2 for Lease Plan.</td></tr>
</table>

vi)	Whether the area is recorded to be in forest (Please specify whether protected reserved etc.)	The entire applied lease area falls in only Patta and no forest area is involved.
vii)	Ownership / Occupancy	31.092 Ha of Patta lands are owned by the company.
viii)	Existence of public road/railway line, if any nearby and approximate distance.	**Road** The mining site is located at a distance of 10 Kms west of Sankar Nagar. The area can also be accessed by road from Tirunelveli to Sankarankovil which gets bifurcated near Sethurayanpudur village **Railway Line** The nearest rail head is at Thaliayuthu, at a distance of 12Km **Airport** : The nearest airport is at Thootukudi which is at a distance of about 60 kms.
ix)	Toposheet No with latitude and longitude	Mining lease area falls in the survey of India Toposheet No. 58 H/9 • Latitude : 8^o 48' 00" to 8^o 47' 40" • Longitude: 77^o 40' 7" to 77^o 40' 33" Key Plan enclosed. Refer **Plate No. 1 & Plate No – 1A for location plan.**
x)	Land use pattern (Forest, Agriculture, Grazing, Barren etc.	The lease area falls in the patta land owned by the Company. There is no Forest nor grazing land in the lease area.

b) Attach a general location and vicinity map showing area boundaries and existing and proposed access routes. It is preferred that the area be marked on a survey of India Topographical map or a cadastral map of forest map as the case may be. However, if none of these are available, the area should on an accurate sketch map on a scale of 1:5000**.**

A general location and vicinity map showing area boundaries and the existing access routes are shown on the location plan which is enclosed as **Plate No.-1A.**

Since the existing routes are being followed to reach the lease area no fresh access routes are shown,

CHAPTER - 3

PART – A

3.0 GEOLOGY & EXPLORATION

3.1 Physiography (Topography and Drainage):

Physiography :

The Mining lease area is almost a flat terrain, with the gradual increase in the gradient from the southern side to the northern side. There is a small hillock on the northern side. There is no natural water course passing through this area. However, as a precaution an earthern bund has been formed on the northern side to prevent rain water flow inside the mine pit. There is no forest land in and around the areas. There is no other important surface feature such as public monuments, place of interest etc., within 5 km radius of the mining lease area. The mine is flanked both on eastern side and western side by mines of M/s. India Cements Limited. The adjacent land on the southern side is also dry land due to meager rainfall in this area. The mining lease area, surrounding the limestone deposit is contoured.

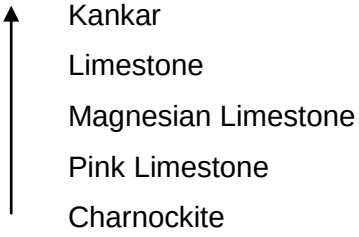
The mining lease area, surrounding the limestone deposit is contoured and the maximum elevation of the area is 91 m above M.S.L and the minimum elevation is 75 m above M.S.L. Refer Surface plan **(Plate – 3)**

Besides this, there are no important surface features such as public monuments, place of interest etc., within 5 Km radius of the mining lease area.

3.2 Geology of the Mine:

The Limestone deposit of Krishna Mines belongs to Archeans and represents the metamorphosed sediments of Dhawarian Age and forms part of the major Ramayanpatti Limestone band, which traverse in the East – West direction and runs for about 3 Kilometers. This is one of the most important limestone formation of Tamilnadu. Many of the captive mines of India Cements Limited and South India Mines and Minerals Industries Limited are located in this limestone band. Limestone is seen occurring as a linear body in the mining lease area. It is narrow in the eastern side and gets wider on the western side. Limestone band is striking in East-West direction. The dip direction is towards south. The angle of dip is 75^0 towards south. This limestone is flanked by Kankar followed by quartzite on the northern side and magnesium limestone, calcareous quartzite and calc gneisses on the southern side.

The country rocks on the hanging wall side are subjected to the effects of weathering and they are quite compact and stable. The contact rocks are also dipping in the same direction. Calc gneiss is seen as a contact rock on the footwall side. The colour of limestone varies from white, honey yellow, blue and pink with varying gradation in physical and chemical characteristics. The general sequence and rock formation from foot wall (North) to hanging wall (South) sides are given below. Refer Geological plan **(Plate – 4)**



The Limestone deposit in the Krishna Mines belongs to Archeans and represents the metamorphosed sediments of Dhawarian Age and forms part of the major Ramayanpatti Limestone band, which traverse on the East – West direction.

Thickness : The limestone band is about 540 m in length with inclusions of charnockite and the associated mafic minerals. Bordering the crystalline limetone, charnockites are seen for 20 -30 m. The inclusions in limestone vary from 0.5 m to 3.0 m.

Chemical Characterisitics : The typical analysis of kankar, limestone and magnesium limestone is included under para 3.4.6 in the mine plan. Typical anlaysis of limestone and magnesium limestone is given under **Table no - 7**

Kankar : The top kankar analysis about 65 – 70 % of total carbonate. But since it is a working mine the entire kankar is removed and utilized.

Typical analysis of limestone and magnesium limestone **Table no - 7**

Cement Grade Limestone			**Magnesium Limestone**		
Caco3	-	84.9	Caco3	-	72.8
MgCo3	-	1.8	MgCo3	-	14.2
Sio2	-	9.4	Silica	-	11.5
Cao	-	48	Cao	-	40
Mgo	-	1	Mgo	-	7.1
R203	-	3.2	R203	-	1.0
Loss on Ignition	-	37.6	Loss on ignition	-	40.8

3.3. Exploration

3.3.1. Already Carried out in the Area :

The applicant has done preliminary investigations in the past, like pitting, trenching and drilling core bore holes.

Cross sections (6 nos) were drawn based on the 12 bore holes drilled in 2006 & June 2011. Besides, the earlier drilled 5 bore holes and 6 DTH holes were taken into consideration while computing the reserves. Details of bore holes drilled are given in **Table No – 8**. Refer Bore holes logs enclosed vide **Annexure -9.**

Bore hole KM /N-1 falls in the 31.092 Ha lease only which is under discussion. However part of the angular hole drilled to a depth of 115 m go into the adjacent lease. In this lease only 34 m bisected is taken for estimation. For future proposed holes the diameter & the angle, depth and the intended mRL is mentioned below.

Details of the Bore holes drilled are given below in **Table No- 8**

S.No	Bore Hole No/ID	Location	Depth of Drilling (m)	Type of Borehole
1	BH - 1	N – 333 E - 54	40.00m	Core
2	BH - 2	N – 133 E - 56	60.00m	Core
3	BH - 3	N – 340 E - 214	40.00m	Core
4	BH - 4	N – 139 E - 216	40.00m	Core
5	BH –5	N – 344 E - 373	45.00m	Core
6	BH - 6	N – 145 E - 376	45.00m	Core
7	BH - 7	N – 350 E - 534	85.00m	Core
8	KM/ N -1	N – 300 E - 530	115.0m	Core
9	KM/ I- 1	N – 263 E - 335	51.00m	Core
10	KM/K-1	N – 314 E - 402	81.00m	Core
11	KM/K-2	N – 250 E - 403	87.20m	Core
12	KM/P -1	N – 290 E - 612	65.00m	Core
13	KDV-12	N – 295 E - 470	43.00m	Core
14	KDV-13	N – 260 E - 509	49.00m	Core
15	KDV-14	N – 260 E - 495	52.00m	Core
16	KDV-16	N – 269 E - 363	81.00m	Core
17	KDV-18	N – 311 E - 328	76.00m	Core

Proposed to be carried out:

Enough exploration by bore holes have already been carried out in the lease based on which mining plan is being prepared.

Although sufficient detailed exploration work has been carried out extensively and the reserves have been estimated under proved category further exploration is proposed to convert the reserves placed under and resource category to proved reserves and to further prove the extensions of the limestone. Further it was programmed to drill 14 bore holes during the year 2012-13 (5 holes during the previous scheme period) and 2013-14 (9 holes during the first year of the present plan/scheme period. However the 5 bore holes planned during the last year of the previous scheme period could not be completed and the same will be completed along with 9 holes during the present plan/scheme period. Details of the bore holes proposed are given below in **Table No - 9**.

Details of the bore holes proposed **Table No - 9**

S.No	Year	Proposed Bore Hole Id	Coordinates	Angle of Inclination	Diameter of hole	Intended m RL	Depth (m)	Remarks
1	2013 - 14	PBH - 1	N – 450, E – 50	90^0	Each hole will have a diameter of 54 mm i.e NX Size Core Core	42	40	The entire exploration program of 14 holes will be completed within the next two years
2	2013 - 14	PBH - 2	N – 450, E – 150	90^0		26.4	40	
3	2013 - 14	PBH – 3	N – 450, E – 250	90^0		26.5	40	
4	2013 - 14	PBH – 4	N – 550, E – 150	90^0		88	40	
5	2013 - 14	PBH - 5	N – 550, E – 250	90^0		81	40	
6	2014 - 15	PBH – 6	N – 150, E – 150	90^0		33	40	
7	2014 - 15	PBH – 7	N – 250, E – 50	90^0		66	40	
8	2014 - 15	PBH – 8	N – 600, E – 50	90^0		90	40	
9	2014 - 15	PBH – 9	N – 600, E – 230	90^0		88.5	40	
10	2014 - 15	PBH – 10	N – 350, E – 50	90^0		10.2	40	
11	2014 - 15	PBH – 11	N – 350, E – 150	90^0		-6	40	
12	2014 - 15	PBH – 12	N -130, E - 0	90^0		59.2	40	
13	2014 - 15	PBH – 13	N -85, E - 60	90^0		68.7	40	
14	2014 - 15	PBH - 14	N - 85, E - 160	90^0		52.7	40	
15	2014 - 15	PBH - 15	N-267, E-450	90^0		38.9	40	
16	2014 - 15	PBH - 16	N-280, E-550	90^0		54.00	40	

3.4 **Reserves** :

For the purpose of estimation of reserves, cross sectional method has been followed (Cross sectional area x length of influence in metres x tonnage conversion factor). Six geological cross sections are drawn on the grid lines with equal section interval of 100 metres. Reserves have been calculated upto a depth – 40 RL. Refer **Plate No- 5** for Geological Cross section.

For the calculation of the geological reserves a recovery percentage of 85% and the tonnage conversion factor of 2.5 is assumed. The reserve estimation was done up to – 40 R.L, i.e. up to a depth of 120m.

The lessee has two mining leases, namely RC.NO8480/MM4/2002 (G.O.No.1081) and G.O.No.115 which are adjacent to each other. However the reserves for both the leases have been estimated separately.

Cement grade limestone has been classified on the basis of CaO and MgO content of limestone, which could be used in the process of manufacturing cement and for CEM. The gross reserves for limestone, which are mainly white and pink limestone within the mining lease area was estimated. Besides high magnesium limestone which has a good market in various industries and can also be blended with high grade limestone and used in cement manufacture is also considered for reserve estimation.

Geological & Mineable Reserves as 30.06.2011(As given in previous scheme of Mining)

Table No - 10

MINERAL	**GO.No. 1081/Rc.No 8480/MM4/2002**	**GEOLOGICAL RESERVES (Tonnes)**	**MINEABLE RESERVES (Tonnes)**
Lime Stone	Limestone	6843201	6538019
	High Mg Limestone	6133377	5933712
SUB TOTAL		**12976578**	**12471731**
MINERAL	**GO.No. 1081/Rc.No 8480/MM4/2002**	**RESOURCES (Tonnes)**	**RESOURCES (Tonnes)**
Lime Stone	Limestone	**1424806**	**1411349**
	High Mg Limestone	**530120**	**492210**
SUB TOTAL		**1954926**	**1903559**
GRAND TOTAL		**14931504**	**14375290**

The reserves estimated above are as on 30.06.2011. The production during the last 2 years of the scheme period i.e 2011-12 & 2012-13 (upto end of Nov 2012) is reduced from the already estimated reserves to arrive at the residual reserves.

The quantity of limestone produced from the mines during 2011-12 & 2012-13(upto end of Nov – 2012) is 619192 Tonnes. Hence the residual mineable reserve is 11852539 Tonnes or 11.852 Mil.T(**12471731 – 619192 = 11852539 T).**

However, as a cross check, the reserves were again re-estimated based on the cross section and the residual reserves were arrived. The same has been discussed in the following paras.

3.4.1 Reserves as on 28.01.2013

No additional drilling was undertaken during the previous scheme period. The reserves are updated as on 28.01.2013 i.e from the date from which renewal should be effected.

3.4.2 Reserves as per UNFC Classification :

Parameters considered for reserves / resources estimation :

- 17 bore holes(core drilling) for a total metreage of 1055.20 m has been drilled which forms the basis of reserve estimation. Refer Geological plan (**Plate No– 4**)
- The spacing of bore holes is on average 200 * 100.
- Since detailed exploration is carried out as per the requirement of UNFC classification the Geological axis is kept as G1.
- Tonnage Conversion factor of limestone and waste considered for reserves computation is 2.50-tones/cubic meter volume respectively.
- Limestone deposits are always associated with solution cavities and clay pockets and cavity fillings. This deposit is no exception. Keeping in view of all these factors and a recovery factor of 85%, for the purpose of reserve estimation is arrived at. The 85 % recovery also takes care of the mining losses, safety parameters etc.
- The reserve estimation is done based on the cross sectional method.
- Cross sections are drawn with the existing results obtained from the boreholes drilled.
- 6 Cross sections were drawn based on which the reserves estimation is carried out.
- The reserves have been estimated upto a depth of bore hole drilled in each of the sections and no lateral extension has been assumed for reserve estimation.

Since the reserves were estimated upto the depth of bore holes drilled with no lateral extensions there is slight very little or no change in the reserves.

A) Proved mineral reserves (111)

- For the calculation of the mineable reserves, safety distance and bench parameters are considered.
- A 45^0 line is drawn on the footwall and the hang wall side and the ultimate pit limit is established for calculation of the reserves.

Similarly the mineable reserves are Limestone and magnesium limestone respectively. works out to 10.192 Mil.T, of which 6.282 and 3.910 Mil.T respectively.

B) **Blocked Mineral reserves(Feasibility Mineral Resource 211)**

Reserves blocked in the safety zone and other mining parameters formed feasibility Mineral Resource 211 which works out to 2.19 Mil.T out of which 1.159 and 1.033 Mil.T is limestone and high magnesium limestone respectively.

C) **Inferred Mineral resources - 333**

Reserves projected upto -40 RL (Along section EE' and FF') formed Inferred Mineral resources. As limestone occurance is traced to a depth of -40RL in other sections i.e AA' to DD' the reserves are projected along EE' and FF'. Inferred Mineral Resource 333 works out to 1.225 Mil.T out of which 0.395 and 0.829 Mil.T is Limestone and high magnesium limestone respectively.

Detailed calculation of reserves is given in **Table No - 12**

UNFC classification:

The details of the reserves as per UNFC classification is given in Table No -11

Proved Mineral Reserves - CODE - 111

As per the UNFC classification a code of 111 is given for proved Ore. The reasons for assigning codes are explained below.

The salient points assumed while arriving at the UNFC code is as follows

- The deposit has a regular habit one with steep dip. Hence the deposit can be treated as strata bound deposit of regular habit.
- Detailed exploration has been carried out by drilling 17 bore holes and 6 DTH holes. Hence the reserves falling within the drilled blocks are treated as proved reserves.
- Mining is under operation economically since 1963. Hence higher level of code i.e. 1 has been given for proved reserves.

Feasibility Mineral Resource - CODE – 211

- Reserves have been established taking into consideration both quality and quantity. Hence geology code is given as “1”.
- Feasibility study is carried out, hence the feasibility axis is given as “1”
- However since the reserves are blocked in the safety margin which cannot be mined, the Economic axis is assumed as 2.

Inferred Mineral Resource CODE – 333

For the reserves where grade and mineral quantity can be estimated with low level of confidence, the same is taken as Inferred mineral resource and given a code of 333.

Limestone and High magnesium limestone (As on 28.01.2013) **Table No - 11**

Classification	Code	Quantity (In Tonnes)	Grade
1	**2**	**3**	**4**
Total mineral Reserves (A+B)			
A. Mineral Reserve			+35% CAO
1. Proved Mineral Reserve			
a. Limestone	111	**6282013**	
b. High. Mg. Limestone	111	**3910877**	
2. Probable Mineral Reserve			
a. Limestone	121 & 122	Nil	-
b. High. Mg. Limestone	121 & 122	Nil	-
B. Remaining Resource			
1. Feasibility Mineral Resource	211		-
a. Limestone		**1159393**	-
b. High. Mg. Limestone		**1033703**	-
2.Prefeasibility Mineral Resource	221 & 222	Nil	-
3.Measured Mineral Resource	331	Nil	-
4.Indicated Mineral Resource	332	Nil	-
5.Inferred Mineral Resource	333	Nil	
a. Limestone		**395463**	
b. High. Mg. Limestone		**829600**	
6.Reconnaissance Mineral Resource	334		
		13611047	

Detailed calculation of reserves **Table No - 12**

MINEABLE RESERVES AS ON 28.01.2013 – (PROVED – 111)

		UPTO -40 RL			Limestone.								
								Side Burden		Inter Burden		Silicious Lst	
Sl. No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)
1	A-A'	7820	50	391021	2.5	830919	146633	1700	212450	2144	268052	2876	359455
2	B-B'	5185	100	518500	2.5	1101812	194437	1821	455345	1570	392380	2926	731384
3	C-C'	9433	100	943270	2.5	2004448	353726	2191	547745	4475	1118740	3009	752301
4	D-D'	9970	100	996970	2.5	2118562	373864	2088	522122	2683	670757	663	165840
5	E-E'	1065	100	106481	2.5	226273	39930	1515	378873	1889	472182	1810	452548
6	F-F'	0	100	0	2.5	0	0	0	0	3160	790113	1610	402527
						6282013	**1108590**		**2116535**		**3712224**		**2864055**

		UPTO -40 RL		Magnesian Lst.			
Sl. No.	Section on	Area (sq.m)	Influence	Volume (CU.M)	TCF	Limestone Qty (T)	Mineral Reject
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)
1	A-A'	5582	50	279123	2.5	593136	104671
2	B-B'	4965	100	496485	2.5	1055031	186182
3	C-C'	2816	100	281587	2.5	598371	105595
4	D-D'	3889	100	388867	2.5	826341	145825
5	E-E'	1884	100	188446	2.5	400447	70667
6	F-F'	2059	100	205906	2.5	437550	78141
						3910877	**691081**
			Grand total			**10192890**	**1799672**

Table No - 12

DETAILS OF BLOCKED UP RESREVES (Prefeasibility Mineral Resource 221)

			UPTO -40 RL		**Hg Lst.**		
Sl.No.	**Section on**	**Area (sq.m)**	**Influence**	**Volume**	**TCF**	**Limestone**	**Interburden Waste**
		(m2)	**(m)**	**(m3)**		**(Tonnes)**	**(Tonnes)**
1	A-A'	822	90	73980	2.5	157208	27743
	A-A'	7820	40	312817	2.5	664735	117306
2	B-B'	70	100	7000	2.5	14875	2625
3	C-C'	727	100	72700	2.5	154488	27263
4	D-D'	791	100	79100	2.5	168088	29663
5	E-E'	0	100	0	2.5	0	0
6	F-F'	0	100	0	2.5	0	0
						1159393	**204599**

			UPTO -40 RL		**Magnesian Lst.**		
Sl.No.	**Section on**	**Area (sq.m)**	**Influence**	**Volume**	**TCF**	**Limestone**	**Interburden Waste**
		(m2)	**(m)**	**(m3)**		**(Tonnes)**	**(Tonnes)**
1	A-A'	1205	90	108450	2.5	230456	40669
		5582	40	223298	2.5	474509	83737
2	B-B'	1098	100	109800	2.5	233325	41175
3	C-C'	379	100	37900	2.5	80538	14213
4	D-D'	70	100	7000	2.5	14875	2625
5	E-E'	0	100	0	2.5	0	0
6	F-F'	0	100	0	2.5	0	0
						1033703	**182418**
				Grand total		**2193095**	**387017**

DETAILS OF RESOURCES (Inferred Mineral Resource 333)

Table No - 12

			UPTO -40 RL		**Hg Lst.**		
Sl.No.	**Section on**	**Area (sq.m)**	**Influence**	**Volume**	**TCF**	**Limestone**	**Interburden Waste**
		(m2)	**(m)**	**(m3)**		**(Tonnes)**	**(Tonnes)**
1	A-A'	0	50	0	2.5	0	0
2	B-B'	0	100	0	2.5	0	0
3	C-C'	0	100	0	2.5	0	0
4	D-D'	0	100	0	2.5	0	0
5	E-E'	1861	100	186100	2.5	395463	69788
6	F-F'	0	100	0	2.5	0	0
						395463	**69788**

			UPTO -40 RL		**Magnesian Lst.**		
Sl.No.	**Section on**	**Area (sq.m)**	**Influence**	**Volume**	**TCF**	**Limestone**	**Interburden Waste**
		(m2)	**(m)**	**(m3)**		**(Tonnes)**	**(Tonnes)**
1	A-A'	0	50	0	2.5	0	0
2	B-B'	0	100	0	2.5	0	0
3	C-C'	0	100	0	2.5	0	0
4	D-D'	0	100	0	2.5	0	0
5	E-E'	2162	100	216200	2.5	459425	81075
6	F-F'	1742	100	174200	2.5	370175	66109
						829600	**147184**
				Grand total		**1225063**	**216971**

ECONOMIC AXIS

SL. NO	E 1 (Economic)	Status
1.	Detailed exploration.	Detailed exploration is carried out. Further it is pertinent to state that the mine is in operation since 1963 proving its economic viability
2.	Mining report / mining plan/ working mines.	Mining plan and report is being regularly prepared and the mine is being worked systematically and scientifically
3.	Specific end – use grades of reserves (Above economic cut – off grade).	The limestone produced from this mine is supplied to India Cements Limited at Sankar Nagar cement factory which is located at a distance of about 10 kms. Besides, the high magnesia limestone is utilized for CEM manufacturing and part of it is also sold.
4.	Specific knowledge of forest / non forest and other land use data.	The entire lease area is a patta land owned by the company and falls in non forest area

FEASIBILITY AXIS

Feasibility assessment studies form an essential part of the process of assessing a mining project. The typical successive stages of feasibility assessment i.e. geological study (F3) as initial stage followed by prefeasibility study (F2) and feasibility study (F1) / mining report are well defined. The degree of economic viability (economic or sub economic) is assessed in the course of prefeasibility and feasibility studies. A prefeasibility study proves a preliminary assessment with a lower level of accuracy than that of a feasibility study, by which economic viability is assessed in detail.

Presently feasibility study (F1) has been carried out as base for feasibility assessment purpose and the following parameters are taken for assessment.

SL. NO	F 1 (Feasibility study)	Status
1.	**Geology:** Geology of area and project, detailed exploration, closed spaced drilling; ore body modeling, bulk samples for beneficiation, geotechnical and ground water & surface waters studies.	**Geology**: Geology of area and project, detailed exploration, geotechnical studies have been carried out the details of geology is given under chapter 3.0 of Mine plan
2.	**Mining:** Mining plan**,** mine recoveries and efficiencies, equipment selection, manpower requirement.	**Mining**: Detailed Mine planning, recovery and selection of equipment are furnished under chapter 3.0 (Reserves), Mining Chapter 4.0 etc. Details of manpower is furnished in Chapter 9.0 under Manpower potential.
3.	**Environment:** EIA studies and EMP including socio – economic impact, rehabilitation of project affected persons, waste disposal/ reclamation, detailed land use data.	**Environment**: EIA studies are being carried out for mining for obtaining Environmental clearance and the approval for the same is under process.
4.	**Processing**: Pilot scale investigation data, list of equipment, manpower and environmental consideration like waste disposal of tailing, etc.	**Processing:** No processing is involved except for size reduction by crushing which is carried out inside the cement plant premises**.** Brief description of the same is enclosed in the mining plan under chapter 10.0.
5.	**Infrastructure and services, construction activities:** Full details	**Infrastructure and services :** Infrastructure services necessary for the operation of the mining activities is provided and is discussed under Chapter 9.0 under site services.

6	Costing : Captial and operating costs-rough estimates based on comparable mining operations.	Enclosed below as a separate **Table No-13 &14**
7	Marketing : An overview on marketing aspects, demand supply relations and industry structure.	The limestone produced is supplied to India cement plant and high Magnesia limestone is utilized for cem making(captive consumption) and part of it is also sold.
8	Economic viability : Preliminary study of cash flow forecast.	Not applicable as the entire limestone mined is supplied to India cements Plant and high magnesia limestone is also for captive consumption and a part of it is sold. Refer **Table No - 15**
9	Other factors ; Statutory provisions relating to labour, land, mining, taxation, etc.	The applicant shall fulfill all the statutory compliances under Mines Rules 1955, Mines Act 1952, Metaliferous Mines Regulation 1961, Mines Vocational Training Rule 1966, Mineral Concession Rules 1960, MM(RD) Act 1957, MCDR 1988, Explosives Rule 2008, Indian Electricity Rules, payment and Minimum wages Act, TNPCB and MOEF, Forest etc.,

Table No - 13

KRISHNA MINES
23, Sripuram, Tirunelveli - 627 001

Capital Cost:

EQUIPMENT	NOS.	VALUE
Car-Washing Unit	1	16459
Compressor- With Tractor	1	134961
Diesel Tanker	1	298535
Dumper-1	1	215557
Dumper-2	1	215557
Generators	1	1329869
Genset-415-Kv	1	388500
Mobile Ligting Towers - 3 No	1	1770681
Poclain--4-(Pc-210)	1	5684500
Poclain--Ck-300	1	1067110
Poclain--90-Ck--(A-3670)	2	2299658
Pumps	1	375370
Rock Breaker	1	485391
Rocker Breaker-2	1	970931
Weighbridge	1	377739
Welding Machine	1	14809
Wheel Loader--1	1	165461
Wheel Loader--2	1	1430742
Xah-210 Compressor--(Six Cylinder)	1	1110562
Tippers	5	6000000
Total		**24352392**

Table No - 14

Operating Cost:

COST PER MT (Avg) **Rs.191**

EXPENDITURE 2011-12	Rs.	%	Rs.
SALARIES	28177509	40%	75.34
STAFF WELFARE	626235	1%	1.67
BONUS	1622456	2%	4.34
ROYALTY & CESS	371693	1%	0.99
PRINTING & STATIONERY	183433	0.26%	0.49
POSTAGE & COURIER	28124	0.040%	0.08
TELEPHONE & FAX	650831	1%	1.74
TAXES & FEES @ 30% of Sales	735940	1%	1.97
CANTEEN EXP	768909	1%	2.06
DRILLING	244769	0%	0.65
ROCK BREAKER MAIN	89767	0%	0.24
MINING EXP	2593293	4%	6.93
BLASTING	1197327	2%	3.20
ELECTRICAL MAINTENANCE	741289	1%	1.98
ELECTRICITY CHARGES	2584753	4%	6.91
CONVEYANCE	9551	0.013%	0.03
STORES & SPARES	2809419	4%	7.51
REPAIRS & MAINTENANCE	375699	1%	1.00
DIESEL & OIL	10243065	14%	27.39
INSURANCE	388712	1%	1.04
SECURITY CHARGES	1419608	2%	3.80
PROFESSIONAL CHARGE	2740892	4%	7.33
OTHERS	10535595	15%	30.17
INSTALMENT	81366	0.11%	0.22
OFFICE MAINTENANCE	70239	0.10%	0.19
PAPER & PERIODICAL	38044	0.05%	0.10
WORK SHOP EXP	1465138	2%	3.92
WEIGH BRIDGE MAINTEN	46233	0.07%	0.12
		100%	
GRAND TOTAL	70839889	191	**191**

Table No - 15

KRISHNA MINES 23,Sripuram, Tirunelveli 627 001					
FUNDS FLOW STATEMENT	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**
PROFIT FOR THE YEAR	66270120.00	85937385.00	102360418.00	118215995.00	99768260.00
Less: Advance Income Tax Paid	29611600.00	30780000.00	30700000.00	35000000.00	29930000.00
Total Source	**36658520.00**	**55157385.00**	**71660418.00**	**83215995.00**	**69838260.00**
Asset Purchased	16600620.00	18199640.00	17177418.00	20496000.00	17774160.00
Changes in Working Capital	20057900.00	36957745.00	54483000.00	62719995.00	52064100.00
Total Application	**36658520.00**	**55157385.00**	**71660418.00**	**83215995.00**	**69838260.00**
Calculation of Changes in Working Capital:					
Current Assets					
Trade Debtors.	6022000.00	14001000.00	17450000.00	21000000.00	23373000.00
Advances recoverable in cash or kind					
or for Value to be received.	318000.00	2224000.00	4346000.00	7363000.00	4292000.00
Trade Deposits, Advances, Royalty Payments, Cess,					
and Other Trade Deposits.	10105000.00	18803000.00	26265000.00	19592000.00	14065000.00
Stock in hand	4711000.00	8860000.00	5807000.00	7300000.00	5562000.00
Sister Concern	20000.00	13000.00	22000.00	23000.00	8000.00
Cash on hand.	125000.00	8000.00	12000.00	15000.00	10000.00
Cash at Banks, Post Office SB. Account, CA.A/c					
and other deposits	4073000.00	-3268000.00	10514000.00	8496000.00	5574000.00
Input Tax on Capital goods	9000.00	6000.00	10000.00	10000.00	6000.00
	25383000.00	**40647000.00**	**64426000.00**	**63799000.00**	**52890000.00**
LESS: Current Liabilities					
Trade creditors	5032000.00	3483855.00	9624800.00	745705.00	393000.00
Outstanding payments	1500.00	0.00	200.00	300.00	700.00
Duties and Taxes	3000.00	2000.00	4000.00	4000.00	5500.00
Provisions	288600.00	203400.00	314000.00	329000.00	426700.00
	5325100.00	**3689255.00**	**9943000.00**	**1079005.00**	**825900.00**
Changes in Working Capital	**20057900.00**	**36957745.00**	**54483000.00**	**62719995.00**	**52064100.00**

PROVED ORE:

GEOLOGICAL AXIS

SL. NO	G 1 (Detailed Exploration)	Status
1.	**Geological survey :** (i) Mapping – for other minerals 1:1000. (ii) Preparation of detailed topographical –cum- geological map including all surface geological features, extent of deposit, structure, location of boreholes, assay plan and sections of exploratory mine development and borehole data; (iii) Top grid / triangulation stations / identified fiducials linking in the maps.	i) Mapping : Detailed mapping in 1:2000 scale is conducted ii) A detailed topographic cum geological map is prepared incorporating all the surface geological features, Bore holes, a contour interval of 1m. Based on the bore holes, 6 geological cross sections were constructed and the reserves were estimated iii) Permanent bench marks have been established and the co-ordinates of all the corner points were given
2.	**Geochemical survey:** Detailed grid pattern sampling and analysis.	Detailed sampling of the Bore holes were conducted and the same were analysed. The analytical data was utilized in the construction of the sections.
3.	**Geophysical survey:** Detailed and specific borehole geophysical survey.	Detailed exploration was conducted by drilling of core bore holes, hence geophysical survey is not necessary.
4.	**Technological:** (i) Drilling – closer spaced (with definite grid pattern) than that for G2 category; For coal, i) Density of boreholes to be 12 to 15 per sq. Km. depending on the complexities for geo structural proving. (ii) Exploratory mining and check drilling results if possible; (iii) Sampling – systematic pit and trench sampling, core and sludge sampling for laboratory scale and bulk sample for the pilot plant scale beneficiation studies.	**i) Drilling:** Detailed drilling in the ore zone has been conducted by drilling 17 no of Bore holes with a spacing of about 200 * 100 m (Average). **ii)Exploratory mining** : Further mine is in operation since 1963 and the drill results are correlatable with the actual mining being carried out iii) Systematic sampling of the bore holes have been carried out and the same is utilized for cross section preparation and reserves estimation.

5	**Petrographic and mineragraphic study**; Refining of data on the petrographic character of rocks of the deposit and its surroundings, alterations (if any), including study of grain size texture gangue and its liberation characteristics for further refining of data.	No Petrographic studies have been carried out. However physical characteristics of limestone are tested while carrying out the exploration activities.
6	**Geo statistical analysis** of borehole data thickness of ore : Waste encountered in holes, assay values of samples if considered necessary.	No Geo statistical analysis has been conducted. However thickness of ore is ascertained based on the drilling data.

Refer **Annexure – 10** for Feasibility report

3.5 Grade of limestone and High Magnesium limestone:

Typical analysis of Limestone and Magnesium limestone:

Table No- 7

Cement Grade Limestone			**Magnesium Limestone**		
Caco3	-	84.9	Caco3	-	72.8
MgCo3	-	1.8	MgCo3	-	14.2
Sio2	-	9.4	Silica	-	11.5
Cao	-	48	Cao	-	40
Mgo	-	1	Mgo	-	7.1
R203	-	3.2	R203	-	1.0
Loss on Ignition	-	37.6	Loss on ignition	-	40.8

The analysis has been carried out in the Lab of India Cements factory at Sankar Nagar. The lab has latest facilities of analysis like XRD. The analysis results are enclosed on the letter head of India Cements. More over the limestone, being analysed in the lab of India Cements, is being consumed in their factory for cement manufacturing. Further results of samples analysed in NABL accreditated lab are enclosed vide **Annexure - 11**

Details of the results of NABCB lab is summarized below in Table No- 16

Table No- 16

S. No	**Samples**	**CaO %**	**MgO %**	**SiO2 %**
1	Lime stone	39.36	3.52	21.64
2	Lime stone	45.25	1.60	11.52
3	Lime stone	46.29	2.62	11.14
4	Lime stone	43.07	0.37	16.44
5	Lime stone	45.22	3.81	10.29
6	Lime stone	45.10	3.79	10.42
7	Sub grade	36.41	1.43	26.79

The entire analysis of 7 bore holes drilled recently have been analysed in NABL Accreditated lab. Refer **Annexure - 11** for analysis results from accreditated lab.

CHAPTER - 4

4.0 MINING:

4.1 Salient description of present mining methods:-

The method of working is opencast mechanized mining considering various technical parameters like surface topography, continuation of limestone deposit, quality variations, geo-technical aspects, required rate of production etc. It is proposed to work this deposit by adopting 10.0 m bench height and width of more than the height of benches i.e. more than 10 m, with an ultimate pit slope of 45°. The benches shall be 10.0 m in height and the ramp gradient shall be kept minimum of 1 in 16.

The western side area of the lease hold belongs to Nanjinkula (regrouped) limestone mines of India Cements Ltd. The lessee has a common boundary permission under 111(2) of MMR – 1961.(Refer **Annexure No – 16**).

Mining is being carried out by open cast method. Systematic mine development and winning of limestone is planned up to a depth of 115 m in this mine i.e. up to – 40RL which is considered as economical mining limit. Based on the disposition and the width of the limestone body, the ultimate pit limit is arrived accordingly.

The mine is worked along the strike of limestone in the East- West direction. The mine being worked at present has a dimension of 625 m x 525 m and the present working is at - 10 R.L

On the hang wall side (Northern side) major development is done on the North western side along section AA', BB' and CC'. The major development is to push the benches of Charnockite and siliceous limestone to work the bottom benches.

On the footwall side (Southern side) major development is done on the North western side along section DD', EE' and FF'. Here also the major development is to push the benches of Charnockite and siliceous limestone to work the bottom benches.

The side wall development will be carried out with the help of deep hole drilling, blasting and excavation by shovels in combination with rear dumpers. During production of limestone deep hole drilling and blasting will be adopted. Rock breaker will be used for breaking of oversize boulders. Limestone benches will be slices of 5m and will be merged as 10m as the bench reaches the side wall.

The side wall development will be carried out with the help of shovels, dumpers and dozer and the height of the benches in development is being maintained as 10m, which would be the safe working height of shovels deployed. Specific permission from Directorate of Mines safety has been obtained for adopting a system of deep hole blasting and for working with the help of heavy machinery for digging, excavation and removal of ore etc. under regulation 106 (2) (b) of Metalliferrous Mines Regulation 1961.

The lessee has applied for Environmental clearance for a maximum production of 4.55 Lakhs tonnes per annum which is under process.

4.2 Year wise development for the ensuing 5 years period:-

- The actual percentage of various productions like limestone, magnesium limestone and other mineral rejects, are indicated in the table below.
- The siliceous limestone estimated from each section is considered as sub grade limestone as the CaO content is more than the threshold limit specified by IBM i.e 35 % CaO.
- The dumping area for the sub grade mineral is specified on the southern side of the lease between co-ordinates N40 to N 145 & E200 to E 615.
- The area for waste dumping is utilized in the North western side of the lease along with Co-ordinates N 540 to N 690 & E 00 to E 300 is mentioned. The location of both the waste dump and the sub grade dump is shown on the yearwise production and development plans (6A to 6E), Environment plan, PMCP and Environment Management Plan.
- The production mentioned in the renewal application(Form – J) is the existing production where as the lessee is going for Environmental clearance from MOEF as per the production figures given in the present mine plan.

Summary of yearwise production and development and details of production and development are given in Table No – 17 & 18

Summary of yearwise production and development for the next five years. **Table No – 17**

Year	Limestone	Percent of Limestone production	Magnesian Limestone	Percent of Mag.L.st production	Total Production	Mineral Reject	Perecent of Mineral reject	Sibeburden	Interburden	Total waste	Sub grade (Sil.Limestone)
	(Tonnes)	(%)	(Tonnes)	(%)	(Tonnes)	(Tonnes)	(%)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)
2013-14	271262	60.84	174608	39.16	445870	78682	17.64	0	240845	319527	269842
2014-15	297228	65.40	157242	34.60	454470	80201	17.64	93199	111706	285106	163662
2015-16	271530	60.00	181008	40.00	452538	79860	17.64	11513	178874	270247	195763
2016-17	298262	66.13	152738	33.87	451000	79588	17.64	44235	224699	348522	142247
2017-18	257842	56.63	197455	43.37	455297	80347	17.64	69774	212473	362594	155017
TOTAL	**1396124**	61.80	**863051**	38.20	**2259175**	**398678**	17.64	**218721**	**968597**	**1585996**	**926531**

Details of production of limestone and magnesian limestone during the plan period :

Table No – 18

S.No	Year	Section along	Production	Production Quantity from mnes (T)	Section along	Development	Waste Quantity (T)	Ore : O.B
1	1st Year (2013-14)	Section BB', CC' & DD',	East 70 – 400 / North 135 – 345	445870	Section AA', BB' & CC',	East 00 – 290 /North 415 - 575	319527	1 : 0.72
2	2nd Year (2014-15)	Section AA', BB', CC' & DD',	East 30 – 320 / North 130 – 355	454470	Section AA' BB', CC', DD' & EE'	East 00 – 290 /North 415 - 575 East : 300 – 560 / North : 175 – 220 East : 70 – 230 / North : 70 – 230	285106	1 : 0.63
3	3rd Year (2015-16)	Section AA', BB', CC' & DD',	East 15 – 400 / North 120 – 345	452538	Section AA' BB', CC', DD' EE' & FF'	East 00 – 290 /North 415 – 575 East 400 – 500 /North 150 - 220	270247	1 : 0.60
4	4th Year (2016-17)	Section AA', BB', CC' DD'& EE'	East 50 – 460 / North 50 – 400	451000	Section AA' BB', CC', DD' & EE'	East 00 – 290 /North 415 – 575 East 260 – 505 /North 105 – 295	348522	1 : 0.77
5	5th Year (2017-18)	Section CC', DD' & EE'	East 175 – 500/ North 130 – 330	455297	Section AA' BB', CC', DD' EE' & FF	East 00 – 290 /North 415 – 575 East 365 – 550 /North 110 – 230	362594	1 : 0.80
				2259175			1585996	1 : 0.70

Ist year (2013-14) : During the I year (2013-14) of the mining plan period working will be carried out along section BB',CC' & DD', between the coordinates East 70 – 400 / North 135 – 345. A production of 445870 T will be carried out. The total handling of waste is around 319527 T along section AA', BB' & CC' between coordinates East 00 – 290 /North 415 – 575. The ore :O.B is 1 : 0.72.

IInd year (2014-15) : During the II year (2014-15) of the mining plan period working will be carried out along section AA', BB', CC' & DD', between the coordinates East 30 – 320 / North 130 – 355. A production of 454470 T will be carried out. The total handling of waste is around 285106 tonnes along section AA', BB', CC', DD' &EE' between coordinates East 00 – 290 /North 415 – 575, East : 300 – 560 / North : 175 – 220 and East : 70 – 230 / North : 70 – 230. The ore :O.B is 1 : 0.63.

IIIrd year (2015-16) : During the III year (2015-16) of the mining plan period working will be carried out along section AA', BB' CC' & DD', between the coordinates East 15 – 400 / North 120 – 345. A production of 452538 T will be carried out. The total handling of waste is around 270247 T along section AA', BB', CC', DD', EE' & FF' between coordinates East 00 – 290 /North 415 – 575 & East 400 – 500 /North 150 – 220. . The ore :O.B is 1 : 0.60.

IVth year (2016-17) : During the IV year (2016-17) of the mining plan period working will be carried out along section AA', BB', CC' DD'& EE', between the coordinates East 50 – 460 / North 50 – 400. A production of 451000 T will be carried out. The total handling of waste is around 348522 along section AA', BB', CC', DD' &EE' between coordinates East 00 – 290 /North 415 – 575 & East 260 – 505 /North 105 – 295. . The ore :O.B is 1 : 0.77.

Vth year (2017-18) : During the IV year (2017-18) of the mining plan period working will be carried out along section CC', DD' & EE', between the coordinates East 175 – 500/ North 130 – 330. A production of 455297 T will be carried out. The total handling of waste is around 362594 T along section AA', BB', CC', DD', EE' & FF' between coordinates East 00 – 290 /North 415 – 575 & East 365 – 550 /North 110 – 230. The ore :O.B is 1 : 0.80

Refer **Plate No – 6A to 6E** for yearwise production and development plan and **Plate No – 7** for Yearwise sections

4.3 Year wise production of limestone during the mining plan period:-

Details of Location, bench parameters, R.L and yearwise quantities **Table No - 19**

Year	Section	RL (In m)	Production(T)		Total Production (T)	Total waste Tonne (T)	Ratio T : T	No. of Ore benches	Height of Bench
			LST	Mg. LST					
2013-14	**Section BB', CC' & DD',**	BB' - 30 RL to --(-10R.L) CC' - 30 RL to 0R.L	271262	174608	445870	319527	1 : 0.72	**Along BB' –** 5 benches in Magnesian Limestone **Along CC' –** 4 benches in Limestone	Bench Height- 10 m & width– 14 m
2014-15	**Section AA', BB', CC' & DD',**	AA' – 10 RL to (-10 RL) BB' - 30 RL to (-20R.L) CC' - 30 RL to 0R.L DD' – 40 to 30 RL	297228	157242	454470	285106	1 : 0.63	**Along AA' –** 2 benches in Magnesian Limestone **Along BB' –** 5 benches in Magnesian Limestone 1 Bench in limestone **Along CC' –** 3 benches in Limestone **Along DD' –** 2 benches in Limestone	Bench Height- 10 m & width– 14 m

Year	Section	RL (In m)	Production(T)		Total Production (T)	Total waste Tonne (T)	Ratio T : T	No. of O.B & Ore benches	Height of Bench
			LST	Mg. LST					
2015-16	**Section AA', BB', CC' & DD',**	AA' – 40 RL to (-10 RL) BB' - 30 RL to (-20R.L) CC' - 30 RL to 0R.L DD' – 58.5 RL to 30 RL	271530	181008	452538	270247	1 : 0.60	**Along AA'** 3 benches in Magnesian Limestone 2 benches in Limestone **Along BB'** 5 benches in Magnesian Limestone **Along CC' –** 2 benches in Limestone 1 bench in Magnesian Limestone **Along DD' –** 3 bench in Limestone	Bench Height- 10 m & width– 14 m
2016-17	**Section AA', BB', CC' DD'& EE'**	AA' – 00 RL to (-10 RL) BB' - 00 RL to (-20R.L) CC' - 30 RL to 0R.L DD' – 30 RL to 20 RL EE' – 30 RL to 20 RL	298262	152738	451000	348522	1 : 0.77	**Along AA'** 1 bench in Limestone **Along BB'** 2 benches in Limestone **Along CC' –** 2 benches in Magnesian Limestone 1 bench in limestone **Along DD' –** 1 bench in Magnesian Limestone **Along EE' –** 1 bench in Magnesian Limestone	Bench Height- 10 m & width– 14 m

Year	Section	RL (In m)	Production(T)		Total Production (T)	Total waste Tonne (T)	Ratio T : T	No. of O.B & Ore benches	Height of Bench
			LST	LST					
2017-18	**Section CC', DD' & EE'**	CC' – 50 to 10 RL DD' – 40 to 20 RL EE'-	257842	197455	455297	362594	1 : 0.80	**Along CC' –** 3 benches in Limestone 2 benches in Magneisan Limestone **Along DD' –** 2 bench in Limestone	Bench Height- 10 m & width– 14 m

Details of yearwise production and development quantities

Table No - 20

TOTAL YEARWISE QUANTITY

PROVED RESERVES			UPTO -40 RL		Hg Lst.								
								Side Burden		Inter Burden		Silicious Lst	
S.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)	(m^2)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)
1	A-A'	516	50	25782.2	2.5	54787	9668	242	30233	1236	154475	760	95003
2	B-B'	1327	100	132665	2.5	281913	49749	467	116748	1034	258458	965	241245
3	C-C'	2353	100	235294	2.5	500000	88235	18	4465	1196	298904	1244	311004
4	D-D'	1932	100	193239	2.5	410632	72465	105	26354	368	91968	188	46929
5	E-E'	700	100	70019.5	2.5	148791	26257	164	40921	659	164793	929	232350
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						1396123	**246375**		**218720**		**968597**		**926531**

PROVED RESERVES			UPTO -40 RL		Magnesian Lst.		
S.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)
1	A-A'	491	50	24548.8	2.5	52166	9206
2	B-B'	1482	100	148187	2.5	314897	55570
3	C-C'	616	100	61623.1	2.5	130949	23109
4	D-D'	581	100	58072.7	2.5	123404	21777
5	E-E'	1137	100	113711	2.5	241635	42642
6	F-F'	0	100	0	2.5	0	0
						863052	**152303**
				Grand total		**2259175**	**398678**

YEARWISE QUANTITY – 1st YEAR (2013-2014)

PROVED RESERVES			UPTO -40 RL		Hg Lst.		1ST YEAR						
								Side Burden		Inter Burden		Silicious Lst	
S.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0	0	0	304	38023	300	37471
2	B-B'	120	100	11987.9	2.5	25474	4495	0	0	346	86524	406	101415
3	C-C'	757	100	75735	2.5	160937	28401	0	0	382	95621	486	121456
4	D-D'	389	100	38930	2.5	82726	14599	0	0	54	13496	29	7250
5	E-E'	10	100	1000	2.5	2125	375	0	0	29	7182	9	2250
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						271262	**47870**		**0**		**240845**		**269842**

PROVED RESERVES		UPTO -40 RL		Magnesian Lst.			
S.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0
2	B-B'	433	100	43300.2	2.5	92013	16238
3	C-C'	179	100	17913.9	2.5	38067	6718
4	D-D'	119	100	11879.3	2.5	25244	4455
5	E-E'	91	100	9075	2.5	19284	3403
6	F-F'	0	100	0	2.5	0	0
						174608	**30813**
				Grand total		**445870**	**78683**

YEARWISE QUANTITY – 2nd year (2014-2015)

PROVED RESERVES			UPTO -40 RL		Hg Lst.		2ND YEAR						
								Side Burden		Inter Burden		Silicious Lst	
S.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)
1	A-A'	93	50	4673.2	2.5	9931	1752	19	2402	217	27100	161	20080
2	B-B'	788	100	78839.8	2.5	167535	29565	363	90797	173	43282	192	48122
3	C-C'	564	100	56358.7	2.5	119762	21135	0	0	165	41324	218	54554
4	D-D'	0	100	0	2.5	0	0	0	0	0	0	0	0
5	E-E'	0	100	0	2.5	0	0	0	0	0	0	164	40906
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						297227	**52452**		**93199**		**111706**		**163662**

PROVED RESERVES			UPTO -40 RL		Magnesian Lst.		
S.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)
1	A-A'	278	50	13891.3	2.5	29519	5209
2	B-B'	601	100	60105.1	2.5	127723	22539
3	C-C'	0	100	0	2.5	0	0
4	D-D'	0	100	0	2.5	0	0
5	E-E'	0	100	0	2.5	0	0
6	F-F'	0	100	0	2.5	0	0
						157242	**27749**
				Grand total		**454470**	**80201**

YEARWISE QUANTITY – 3rd year (2015 – 2016)

PROVED RESERVES			UPTO -40 RL		Hg Lst.		3RD YEAR						
								Side Burden		Inter Burden		Silicious Lst	
S.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m2)	(m)	(m^3)		(Tonnes)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)
1	A-A'	422	50	21109	2.5	44857	7916	54	6738	240	30001	120	14984
2	B-B'	0	100	0	2.5	0	0	16	4003	172	43010	185	46251
3	C-C'	429	100	42908.7	2.5	91181	16091	0	0	176	43966	210	52493
4	D-D'	638	100	63761.2	2.5	135493	23910	0	0	48	11909	79	19839
5	E-E'	0	100	0	2.5	0	0	3	773	200	49988	249	62196
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						271530	**47917**		**11513**		**178874**		**195763**

PROVED RESERVES		UPTO -40 RL			Magnesian Lst.		
S.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)
1	A-A'	213	50	10657.5	2.5	22647	3997
2	B-B'	448	100	44781.4	2.5	95160	16793
3	C-C'	0	100	0	2.5	0	0
4	D-D'	297	100	29741.4	2.5	63200	11153
5	E-E'	0	100	0	2.5	0	0
6	F-F'	0	100	0	2.5	0	0
						181008	**31943**
				Grand total		**452538**	**79860**

YEARWISE QUANTITY – 4th year (2016-17)

PROVED RESERVES			UPTO -40 RL		Hg Lst.		4TH YEAR						
								Side Burden		Inter Burden		Silicious Lst	
S.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0	55	6896	240	29999	120	14984
2	B-B'	418	100	41837.1	2.5	88904	15689	44	10986	193	48142	182	45457
3	C-C'	392	100	39153.8	2.5	83202	14683	0	0	222	55413	165	41251
4	D-D'	276	100	27555.9	2.5	58556	10333	105	26354	266	66562	0	0
5	E-E'	318	100	31811.7	2.5	67600	11929	0	0	98	24582	162	40554
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						298262	**52634**		**44235**		**224699**		**142246**

PROVED RESERVES			UPTO -40 RL		Magnesian Lst.		
S.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0
2	B-B'	0	100	0	2.5	0	0
3	C-C'	96	100	9594.5	2.5	20388	3598
4	D-D'	165	100	16452	2.5	34961	6170
5	E-E'	458	100	45830.3	2.5	97389	17186
6	F-F'	0	100	0	2.5	0	0
						152738	**26954**
				Grand total		**451000**	**79588**

YEARWISE QUANTITY -5th year (2017-18)

PROVED RESERVES			UPTO -40 RL		Hg Lst.		5TH YEAR						
								Side Burden		Inter Burden		Silicious Lst	
S.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m^2)	(m)	(m^3)		(Tonnes)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)	(m^2)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0	114	14197	235	29353	60	7484
2	B-B'	0	100	0	2.5	0	0	44	10963	150	37500	0	0
3	C-C'	211	100	21137.8	2.5	44918	7927	18	4465	250	62579	165	41250
4	D-D'	630	100	62991.6	2.5	133857	23622	0	0	0	0	79	19839
5	E-E'	372	100	37207.8	2.5	79067	13953	161	40149	332	83041	346	86444
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						257842	**45501**		**69774**		**212473**		**155017**

PROVED RESERVES			UPTO -40 RL		Magnesian Lst.		
S.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0
2	B-B'	0	100	0	2.5	0	0
3	C-C'	341	100	34114.7	2.5	72494	12793
4	D-D'	0	100	0	2.5	0	0
5	E-E'	588	100	58805.5	2.5	124962	22052
6	F-F'	0	100	0	2.5	0	0
						197455	**34845**
				Grand total		**455297**	**80347**
				TOTAL FOR 5 YEARS=		**2259175**	**398678**

4.3 Proposed rate of Production when the Mine is fully developed:

Since the area is a working mine for the past several decades initial development is not necessary. Hence the targeted production of around 4.50 lakh tonnes per annum can be achieved from the first year of the plan period i.e 2013-14 onwards.

Further the mine will be fully developed in accordance with the developmental programme depicted above, so as to meet the required production target.

4.4 Mineable Reserves & Anticipated Life of the Mine:

- For the calculation of the mineable reserves, safety distance and bench parameters are considered.
- A 45^0 line is drawn on the footwall and the hang wall side and the ultimate pit limit is established for calculation of the reserves.

The mineable reserves of limestone and magnesian limestone are **10192890** T(10.19 Mil.T). At the proposed rate of 0.450MTPA of production the life of the mine is expected to be 22.6 say 23 years including the present plan period.

Total mineable reserves	-	10.19 Mil.T
Production during the plan perod	-	2.26 Mil.T (5 years from 2013-14 to 2017-18)
Balance reserves	-	7.93 Mil.T
Conceptual Life of Mine	-	7.93/0.45 = 17.62 years
Total Life of mines	-	5 + 17.62 =22.6 say 23 years.

4.5 Conceptual Mining Plan

Conceptual Mining plan has been prepared after fully taking into consideration the depth persistence of limestone deposit, mineability and economics including recovery of limestone etc which is shown in the conceptual plan and sections (Refer **Plate No - 8 & 9**). The face position at the end of the life of the mine, proposed dump sites are also shown in the plan. Afforestation and land use programme are also furnished according to the guidelines

Mining will be continued for 22.6 or 23 years (including the present plan period) with the capacity of production shown in the table given below and the dumps will be re-handled and refilled into the worked out pits. Eventually no dump will exist in the post operational period.

The mine will be refilled along AA' to DD' between N 75 to N 490 and E 15 to E 435 upto 10 RL. Refilling of mine exhausted area will commence from II Scheme period i.e from 2023-28 onwards. During the current plan period also part of the area is shown temporary

refilling due to shortage of waste dump area. After exhaustion of the pit upto -40 RL along Section AA', BB' and CC' the temporary waste dump storage shown along Section EE' and FF' on mineralized area will be rehandled and mining will continue upto 10 RL. The successive advancement of the pit at the end of conceptual period is depicted in the conceptual mining plan and conceptual section vide **Plate no- 8 & 9.**

During the conceptual plan period the production of 7933710 t or 7.93Mil.T will be carried out for which a development quantity of 6042672T or 6.04 Mil.T respectively will be achieved. During this period about 1937505 T or 1.93 Mil.T of sub grade will be handled. Summary of the conceptual quanitities and the detailed working of conceptual quantities are given below in **Table No -21 & 22**.

Further exploration program has been proposed during the present plan period to prove the bottom of the limestone and as well as configuration of ore body.

Summary of Conceptual quantities **Table No - 21**

Year	Limestone	Magnesian Limestone	Total Production	Mineral Reject	Sideburden	Interburden	Total waste	Sub grade (Sil.Limestone)
	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)
2018-23	1128401	1127146	2255547	398038	782350	393236	1573624	646181
2023-28	1655175	605544	2260719	398950	466004	648222	1513176	486146
2028-32	1693049	563157	2256205	398154	270152	541416	1209722	156684
End of life	409260	751979	1161239	205851	379300	1160998	1746149	648493
TOTAL	4885884	3047826	7933710	1400993	1897806	2743873	6042672	1937505

Details of Conceptual Quantities

Table No - 22

CONCEPTUAL QUANTITY - 1ST SCHEME PERIOD 2018-23

			UPTO -40 RL		LIMESTONE.								
								Side Burden		Inter Burden		Silicious Lst	
Sl.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)
1	A-A'	4300	50	214976	2.5	456824	80616	1378	172210	425	53077	1174	146709
2	B-B'	1975	100	197499	2.5	419684	74062	1354	338500	381	95301	1368	341967
3	C-C'	2371	50	118538	2.5	251893	44452	2173	271640	1959	244859	1260	157505
4	D-D'	0	100	0	2.5	0	0	0	0	0	0	0	0
5	E-E'	0	100	0	2.5	0	0	0	0	0	0	0	0
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						1128401	**199130**		**782350**		**393236**		**646181**

			UPTO -40 RL		Magnesian Lst.		
Sl.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)
1	A-A'	3459	50	172940	2.5	367498	64853
2	B-B'	2931	100	293095	2.5	622826	109910
3	C-C'	1288	50	64387	2.5	136822	24145
4	D-D'	0	100	0	2.5	0	0
5	E-E'	0	100	0	2.5	0	0
6	F-F'	0	100	0	2.5	0	0
						1127146	**198908**
				Grand total		**2255547**	**398038**

CONCEPTUAL QUANTITY - 2ND SCHEME PERIOD 2023-28

			UPTO -40 RL		Hg Lst.								
								Side Burden		Inter Burden		Silicious Lst	
Sl. No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)
1	A-A'	3005	50	150263	2.5	319308	56348	80	9984	484	60539	941	117684
2	B-B'	1883	100	188336	2.5	400215	70626	0	0	155	38703	593	148173
3	C-C'	4709	34	160105	2.5	340224	60039	0	0	1320	112235	505	42960
		2371	50	118538	2.5	251893	44452	2173	271640	1959	244859	1260	157505
4	D-D'	3233	50	161664	2.5	343536	60624	1475	184380	1535	191887	159	19825
5	E-E'	0	100	0	2.5	0	0	0	0	0	0	0	0
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						1655175	**292090**		**466004**		**648222**		**486146**

			UPTO -40 RL		Magnesian Lst.		
Sl. No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)
1	A-A'	1633	50	81634	2.5	173472	30613
2	B-B'	552	100	55204	2.5	117309	20702
3	C-C'	912	34	31005	2.5	65885	11627
		1288	50	64387	2.5	136822	24145
4	D-D'	1055	50	52733	2.5	112057	19775
5	E-E'	0	100	0	2.5	0	0
6	F-F'	0	100	0	2.5	0	0
						605544	**106861**
				Grand total		**2260719**	**398950**

CONCEPTUAL QUANTITY - 3RD SCHEME PERIOD 2028-33

			UPTO -40 RL		LIMESTONE								
								Side Burden		Inter Burden		Silicious Lst	
Sl.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0	0	0	0	0	0	0
2	B-B'	0	100	0	2.5	0	0	0	0	0	0	0	0
3	C-C'	4709	66	310792	2.5	660434	116547	0	0	1320	217868	505	83392
4	D-D'	4804	67.5	324272	2.5	689079	121602	508	85777	780	131662	317	53467
		3233	50	161664	2.5	343536	60624	1475	184375	1535	191887	159	19825
5	E-E'	0	100	0	2.5	0	0	0	0	0	0	0	0
6	F-F'	0	100	0	2.5	0	0	0	0	0	0	0	0
						1693049	**298773**		**270152**		**541416**		**156684**

			UPTO -40 RL		Magnesian Lst.		
Sl.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0
2	B-B'	0	100	0	2.5	0	0
3	C-C'	912	66	60186	2.5	127894	22570
4	D-D'	2253	67.5	152096	2.5	323205	57036
		1055	50	52733	2.5	112057	19775
5	E-E'	0	100	0	2.5	0	0
6	F-F'	0	100	0	2.5	0	0
						563157	**99381**
				Grand total		**2256205**	**398154**

CONCEPTUAL QUANTITY - END OF LIFE OF THE MINE

			UPTO -40 RL		LIMESTONE								
								Side Burden		Inter Burden		Silicious Lst	
Sl.No	Section on	Area	Influence	Volume	TCF	Limestone Qty	Mineral Reject	Area of sibeburden	Quantity	Area of Interburden	Quantity	Area	Quantity
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)	(m2)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0	0	0	0	0	0	0
2	B-B'	0	100	0	2.5	0	0	0	0	0	0	0	0
3	C-C'	0	100	0	2.5	0	0	0	0	0	0	0	0
4	D-D'	4804	32.5	156131	2.5	331779	58549	508	41300	780	63393	317	25743
5	E-E'	365	100	36462	2.5	77481	13673	1352	338000	1230	307500	881	220250
6	F-F'	0	100	0	2.5	0	0	0	0	3160	790106	1610	402500
						409260	**72222**		**379300**		**1160998**		**648493**

			UPTO -40 RL		Magnesian Lst.		
Sl.No.	Section on	Area (sq.m)	Influence	Volume	TCF	Limestone	Mineral Reject
		(m2)	(m)	(m3)		(Tonnes)	(Tonnes)
1	A-A'	0	50	0	2.5	0	0
2	B-B'	0	100	0	2.5	0	0
3	C-C'	0	100	0	2.5	0	0
4	D-D'	2253	32.5	73232	2.5	155617	27462
5	E-E'	747	100	74735	2.5	158812	28026
6	F-F'	2059	100	205906	2.5	437550	78141
						751979	**133629**
				Grand total		**1161239**	**205851**

4.5.1 Time frame of completion of mineral exploration programme in leasehold areas:

- 17 bores holes for a total meterage of 1055.20m have been drilled, the logs of which are attached vide **Annexure – 9**
- Out of 17 bore holes 5 were old bore holes drilled during the year 1993. Although no specific exploration programme by way of core drilling is proposed, 5 holes for a total meterage of 399.20m have been carried out. Subsequently to prove the reserves as per UNFC classification further drilling of 7 holes has been carried out in June 2011 for a meterage of 355M
- Besides, 6 DTH holes have been drilled. The mine is in operation from 1963 onwards.

Drilling has already been carried out in the mineralized area at a grid interval of less than 200x200. However, additional exploration by way of drilling 14 bore holes has been proposed to cover the entire area including non- mineralized area. Further holes has been proposed in the areas not covered with exploration earlier. Refer Geological Plan(**Plate No–4**)

Further it was programmed to drill 14 bore holes during the year 2012-13 (5 holes during the previous scheme period) and 2013-14 (9 holes during the first year of the present mining period. However the 5 bore holes planned during the last year of the previous scheme period could not be completed and the same will be completed along with 9 holes during the present plan period.

In fact the bore holes are proposed to be completed within the 2 years of the present scheme period. Hence no further exploration is envisaged during the Conceptual period.. The entire exploration program is given under para 3.3.1

4.5.2 Whether ultimate pit limit has been determined and demarcated on surface and geological plans:

Ultimate pit limit has been determined based on the mineral economics and quality of limestone from the bore hole data. The ultimate pit will encompass the entire depth of up to the bottom most RL of -40 m RL which will be achieved in the limestone deposit. The same has been marked on the plans.

The average dimension of the pit at the end of life of mine is 630*550 m. The maximum depth of mining is 120 m and the average depth is 74 m.

4.5.3 Whether the site(s) for disposal of waste rock and un saleable ores has/have been examined for adequacy of land and suitability of long term use in the event of continuation of mining activity:

Sufficient care was taken while selecting the site for waste dump based on the economically feasibility and ultimate depth of mining.

During the plan period waste will be dumped on the North western corner of the lease. This area will not affect future mining.

Waste generation during Conceptual Plan period

Table No - 23

Year	Mineral Reject	Sideburden	Interburden	Total waste
	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)
2018-23	398038	782350	393236	1573624
2023-28	398950	466004	648222	1513176
2028-32	398154	270152	541416	1209722
End of life	205851	379300	1160998	1746149
TOTAL	1400993	1897806	2743873	6042672

Already about 19.75 Ha of land is utilized for dumping outside the lease area in the lands belonging to the company. Refer **Table No – 24** for details of the existing dumps.During the plan period an area of about 3.114 Ha will be utilized for dumping the waste. Further 2.425 Ha will be utilized for sub grade dumping.

During the conceptual period temporary dump will be created within the eastern side of the pit. The temporary dump will be rehandled and dumped in the western side of the lease area once the mineral is exhausted in this portion. This will be done during the second scheme period i.e from 2023 onwards. No additional area is required for dumping. Hence the area selected for dumping is adequate.

Details of the Existing Dump

Table No – 24

S. No	Location of Dump	Details of area	Area (In Ha)	Height (in m)	Quantity accumulated (In Mil.t)
1	Southern side	Outside ML area (Surface right owned by Company)	11.00	25	4.125
2	South eastern side	Outside ML area (Surface right owned by Company)	8.75	35	4.593

- Two existing dumps are outside the lease area in the Company's own land in which dumping was carried out previously.
- Now as per the IBM directive it is now proposed to dump waste within the lease.
- Hence only one dump on the north western corner of the lease will be utilized for dumping.
- The 2 waste dumps on the southern side of the lease will not be utilized for dumping.
- Further since the dump area in the northern side of the lease (3.114 Ha) is not sufficient for waste disposal on a long term basis i.e beyond the scheme period, it is proposed to exhaust portion of the pit on the South eastern side of the lease and utilise the same for temporary dumping.
- Also the waste generated from the next scheme period will be utilized for refilling.

4.5.4 Whether back-filling of pit(s) after recovery of ore/mineral up to techno-economically feasible depth envisaged. If so, describe the broad features of the proposal:

Part of the mining lease area after mining up to ultimate depth will be refilled with the waste/ interstitial reject generated during the mining will be fenced and part of the area will be left as water reservoir. The external dumps will be re-handled and refilled in the worked out pits.

Mining will be continued for another 22.6 or 23 years, including the present plan period at the rate of proposed production of 0.45MTPA. The reclamation by way of refilling in the mine exhausted pit will commence from the 2023- 23 i.e. from II scheme period. However due to shortage of area for dumping part of the waste from the fourth year i.e 2016-17 onwards of the present plan period will be dumped in the eastern portion of the lease which will be rehandled from 2023 onwards to refill the exhausted portion on the western side along section AA', BB', CC' and DD'.

4.5.5 Post mining land use envisaged:

The entire deposit of limestone will be exhausted in about 23 years including the present plan period at the production rate of 0.45MTPA.

After exhausting the entire limestone deposit the pit will be partially refilled and the balance unfilled portion will be left as water reservoir.

The mine pit will be properly fenced to avoid un-authorized entry in to the pit. Green belt will be developed all along the periphery of the mining lease area.

The undisturbed area will be utilized during the present mine plan period itself for various mining and allied activities. Hence the area under serial No – 15 is given as Zero

Details of the existing, end of plan period and conceptual land use

Table No - 25

Sl No	Head	Area put on use at start of plan (Ha)	End of 5th year (Ha)	At the end of the life of the mine (Ha)
1	Area of excavation	20.71	23.310	24.210
2	Storage of top soil	Nil	Nil	Nil
3	Overburden/dump	3.01	3.114	2.214
4	Mineral Storage/Sub grade	Nil	2.425	2.425
5	Infrastructure(Workshop/Building)	0.33	0.33	0.33
6	Roads	0.17	0.17	0.17
7	Railways	Nil	Nil	Nil
8	Green belt	1.367	1.429	1.429
9	Tailing pond	Nil	Nil	Nil
10	Effluent treatment plant	Nil	Nil	Nil
11	Mineral Separation plant	Nil	Nil	Nil
12	Town ship area	Nil	Nil	Nil
13	Others (Retaining wall, garland drain etc)	Nil	0.314	0.314
14	Area utilized	25.587	31.092	31.092
15	Area which will remain (Untouched)	5.505	0	0
	Grand Total	31.092	31.092	31.092

4.6 Mining machinery:

Drilling Machine

Drilling is carried out with DTH drills and compressors both for development and production. Besides Jack hammer and compressor will be used for secondary blasting and also sometimes in the production faces. The details of the equipments are given below.

1) **Drilling machines**:

Type	Nos.	Dia. Of hole (mm)	Size/capacity	Make	H.P.
XAH-210	02	115	15 kgf	Atlas Copco	180

Material required for blasting: Limestone +waste+sub grade

Proposed production per day = 1124784 T (2017-18 of the plan period)

: 1124784/300=3750TPD

Spacing & burden : 4.0 & 3.0 m

Depth of Hole : 10.0

Yield per hole of 10 m : 4.0 * 3.0 * 10.0 *2.5 = 300 T

No. of blast holes drilled : 12.5 say 13/ day

Drilling meterage : 143 m(Including Sub grade drilling)

Average drilling rate : 15 m / hr

No:of shifts : 2

Output per machine per shift : 90 m (6 effective working hours)

Output for 2 shifts : 180 m (12 effective working hours)

No. of machines required : 1

Considering 80% availability the requirement of drills, one drill is sufficient to cater the needs of production and development requirements. However one more drill will be kept as standby in case of breakdown of the drilling machine.

Loading equipment (Production)

Type	Nos.	Bucket capacity in Cu.M	Make
Backhoe (PC- 210)	01	2.0	L& t Komatsu

a) Excavating Parameters

C = Nominal Bucket Capacity = 2.0 m^3

F = Bucket fill factor = 0.85

S = Swell factor (at 25% swell) = 0.8

t = Time cycle per pass at 90^o swing = 25 sec

e = Overall efficiency for three working shift = 0.80

T = Seconds per hour = 3600

n = Number of working shifts/day = Two

h = Hours per shift = 8

W = Working days in a year = 300

A = Availability of machine = 0.80

U = Utilisation Factor = 0.80

b) Rate of Production

Output/shovel/hour = (C x F x S x T)/(t) = 2.0x0.85x0.80x3600/25 = 196 m^3

Output/shovel/year = 196 x h x n x w x e x A x U

= 196 x 8 x 2 x 300 x 0.80 x 0.80 x 0.80

= 481690 say 4.816 lac m^3 or 1204224 or 12.06 Lac Tonnes

c) Number of Excavators

Quantity of material to be handled per annum : 455297 TPA During 5th year
(Both Production and development)

No: of Working days : 300 Days

Maximum handling of material required : 455297 Tonnes

Number of excavator (Shovels) required. : 4.55/12.06 = 0.38 say 1 nos

One machine is sufficient to handle production.

(2) Loading equipment (development)

Type	Nos.	Bucket capacity in Cu.M	Make
Excavator (CK - 300)	02	3.0	L & T

b) Excavating Parameters

C =	Nominal Bucket Capacity	=	3.0 m^3
F =	Bucket fill factor	=	0.85
S =	Swell factor (at 25% swell)	=	0.8
t =	Time cycle per pass at 90^o swing	=	25 sec
e =	Overall efficiency for three working shift	=	0.80
T =	Seconds per hour	=	3600
n =	Number of working shifts/day	=	Two
h =	Hours per shift	=	8
W = Working days in a year		=	300
A = Availability of machine		=	0.80
U = Utilisation Factor		=	0.80

b) Rate of Production

Output/shovel/hour = (C x F x S x T)/(t) = 3.0x0.85x0.80x3600/25= 294 m^3

Output/shovel/year = 294 x h x n x w x e x A x U

= 294 x 8 x 2 x 300 x 0.80 x 0.80 x 0.80

= 722534 say 7.22 lac m^3 or 1806336 or 18.06 Lac Tonnes

c) Number of Excavators

Quantity of material to be handled per annum : 669487 TPA During 5th year
(Both Production and development)

No: of Working days : 300 Days

Maximum handling of material required = 669487 Tonnes

Number of excavator (Shovels) required. = 6.69/18.06 = 0.37 say 1 nos

One machine is sufficient to handle development. However one machine will be kept as standby in case of break down. The standby machine will also be used for handling the production in case of breakdown of production machine.

(3) Haulage and transport equipment

(a) Haulage (development)

Type	Nos.	Size/capacity	Make
Dumper	4	25 T	Beml / Terex / HM

a) Hauling units for development :

Quantity handled per annum : 669487
Quantity to be handled – T/day : 669487/300 = 2232 T
No. of shifts per day : Two
Capacity of Tipper : 25
Distance of handling : 2.5 Kms (To and Fro)
Total quantity handled by tipper/hr : 75
Effective working hours in 2 shifts : 12
Total quantity handled by tipper in 2 shifts : 900
No:of tippers required : 3
No:of Spare tippers : 1
Total no:of tippers : 4

(b) **Hauling units for production** :
Haulage (production)

Type	Nos.	Size/capacity	Make
Tipper	8	20 T	Ashok Leyland

Quantity handled per annum : 455297 (5th year of plan period)
Quantity to be handled – T/day : 455297/300 = 2232 T
No. of shifts per day : Two
Capacity of tipper : 20 T
Distance of handling : 20 km for Plant
(to & fro distance)
Total quantity of limestone/marl handled by Tipper/hr: 20 T
Effective working hours for 2 shifts : 12
Total quantity of ore handled by Tipper in 2 shifts : 240 T
No:of Tippers required : 6.32 Say 7
No:of Spare tippers : 2
Total no:of Tippers : 9

4.6.1 List of Mining Machinery:

The following table shows the list of mining machinery is under use for both leases is given below in **Table No- 26**

Table No-26

Sl. No.	Equipment Drilling - Compressor	Capacity	Units	Output per Hour
2.	ATLAS COPCO Compressor	150 P.S.I	1	
3.	DTH WAGON DRILL	115mm dia	2	10 Mt/Hr
4.	Rock Breaker		2	
5.	L & T poclain	CK - 300	2	294 Cu.m/hr
6.	L & T Komatsu	PC -210	1	196 Cu.m/hr
7.	Dumpers (Terex/HM/BEML)	25 Ts	4	
8.	Tippers	20 Ts	9	20T/Hr(Prodcution) & 80T/hr(Development)
9.	D8 Dozer	220	1	
10.	Submersible pump	12.5 H.P	1	
11.	Centrifugal pump	50 H.P	1	
12.	Jeep		1	

CHAPTER - 5

5.0 Blasting :

As the mine is mechanized, the handling of ore and overburden is more; a system of deep hole drilling and blasting is adopted. The bench height is to be maintained maximum of 10 meters and the pattern of drilling is 4.0 m X 3.0 m spacing and burden with 115 mm diameter. The pattern maintained is, Staggered, V etc.

Requirement of limestone/development per day	=	3750 tonnes
Working hours /day in one shift	=	6
No:of shifts	=	2
Effective Working hours /day in two shifts	=	6
Production of limestone/Development /hour	=	3750 / 12 = 312.5 tonnes

5.1. Broad parameters of Blasting :

Average Bench Height	= 10m
Diameter of the hole	= 115mm
Burden and Spacing	= 4m x 3.0m
Sub grade drilling	= 10% more than bench height
Hole Depth	= 11m (with 10% sub grade drilling)
Bulk Density of insitu limestone	= 2.5 tons/m^3

Tonnage per blasted hole is given as

Bench. Ht x Burden x Spacing x Bulk Density= 10.0m x 4m x 3.0m x 2.5 = 300 T

No :of Holes per day	= 3750/300 = 12.5 holes say 13 holes
Powder factor is considered as	= 7.5 tonne/kg
Explosives required per day	= 3750 tons / 7.5 = 500 kg/day

Charge in each hole will be 500/13 = 38.46 kg say 38.5 kgs.

In the production and development faces, drilling will be carried out with Wagon drill and diesel compressor. The diameter of the hole is 115mm and maximum depth will be 11 meters inclusive of 1.0m subgrade drilling with burden and spacing of 4.0 and 3.0 m respectively.

For heavy blasting, cap sensitive explosives, ANFO, non-cap sensitive column charges, detonating fuse and delay detonators are used. Normally 20 to 30 holes are blasted at a time.

5.2 Type of Explosives to be used :

No. 8 ordinary detonators, Electric delay detonators, blue sump fuse, detonating fuse, slurry explosives, ANFO are generally used in routine blasting operations.

Explosives (Monthly consumption) :

1.	Detonating Fuse	:	4000 m
2.	Large Diameter Explosives	:	2500 kgs
3.	A.N.F.O	:	10000 kgs
4.	Delay Detonators	:	500 Nos.

5.3 Precautions to be observed during drilling & blasting:

Adequate safety precautions will be taken during drilling and blasting.

- Adequate care will be taken in handling the drilling and compressor equipments.
- While blasting, adequate measures will be taken right from storage of explosives, transport, charging of holes, blasting and return of explosives.
- The safety distance of 500 m all around the blasting site will be strictly enforced.
- Proper sentries will be posted to clear the men and any living beings in and around the blasting zone.
- Charging & blasting will be avoided whenever the sky is overcast.
- Suitable blasting shelters have been provided at strategic points for the blasters to take shelter during blasting.
- These shelters are suitably covered with sand bags on all the sides and other safety precautions are also being strictly practiced by the blasters during blasting operations

5.4 Storage of Explosives :

The applicant has installed a Magazine at the mine in S.F.No. 719/2. The capacity of this magazine is 1000kgs.

Chapter – 6

6.0 MINE DRAINAGE

6.1 Depth of water table based on observations from nearby wells and water bodies

The average rainfall of this area is around 652.4 mm per annum. The water table in the surrounding areas is in the range of 6.90 m bgl to 10.04 m bgl. Rain water is being diverted towards the eastern side of the mine to prevent water entering the working areas of this mine.

Groundwater is the main source of water in the district. Dug wells, dug-cum bore wells and bore wells are constructed for groundwater use for irrigation. With respect to mining area, 1 bore well exist within the area, drilled upto 36 m deep in the year 2006. The yield of the well is 8500 lit/hr. water level below ground level during Feb-12 is 7.40 m. The bore well is fitted with 5 HP pump and operated for 2 to 3 hrs in a day. The domestic water requirement of the mining project such as drinking, washing and toilet are meet from this bore well. However, the water requirement of mining operations, spraying of water for dust control, spraying of water to hauling/transportation of mined materials and green belt development are meet from the rainwater collected in the mine pit. The following are the break-up of source of water and usage in the project site.

6.2 Present workings has already touched water table at a depth of 60 m (Post Monsoon).

(i) Ground water withdrawal from bore well

Use of Groundwater:

- Domestic: 10 m^3/day x 300days =3000 m^3/yr.

(ii) Collection and Reuse of Mine Pit Water

As already mentioned, **the two adjacent leases are worked contiguously and hence the hydrology of the mine area are studied as a combined one**. During the rainy periods, the rain water is collected in the mine workings and impounded. All though the average annual rainfall is 652 mm, bulk of precipitation of 391.1mm occurs during the monsoon season of Oct to December. With an infiltration rate of 0 .80 and run-off co-efficient of 0.80, the total quantity of rainwater collected in both the mine leases of GO 115 & GO 1081 per annum is computed as below:

Present area of both the mine pits	:	239200 Sqm (51000m2 for GO 115 & 188200 m2 for GO 1081)
Eff. Rainfall	:	0.3129 m
Run-off co-eff	:	0.80
Rainwater collected	:	59876.5 m^3/yr

However considering loss due to evaporation and others is 25% from the mine pit water. **Hence, the effective amount of rainwater de-watered from the mine pit is (59876.5 m^3/yr x 0.75) = 44907 m^3/yr. Say 45,000 m^3/year.**

This quantity is pumped for utilizing it for various purposes such as green belt development and settling of dust during the hauling of vehicles and agricultural use. The break up details are given as below.

Use of Rainwater collected in the Mine Pit:

A) Total Rainwater available in the mine pit = 45,000 m^3/yr
B) Water sprinkling - 40 m^3/day x 300days =12,000 m^3/yr.
C) Green belt development: 10 m^3/day x 300 days = 3,000 m^3/yr
D) Balance mine sump water
available for agricultural use(A-B-C) = 30,000 m3/yr or say 100m^3/day

The following pumps are available at the mines for pumping out of water:

50 HP submersible pumps - 3

Two pumps will be in operation and one pump will be standby.

CHAPTER – 7

7.0 Indicate briefly the nature and quantity of top soil, overburden / waste and mineral rejects likely to be generated during the next five years

7.1 Nature of Waste

The waste in the mine is mostly Charnockite and Quartzite, which are dumped separately. Since it is working mine from1963 there will be no generation of top soil. About 1.585 Mil.T of waste will be generated during the present plan period. Besides 6042672 T or 6.0426 Mil.T of waste is likely to be generated during the conceptual period.

The chemical characteristics of the waste is as follows in Table No- 27

S.No	Nature of waste	Chemical composition
1	Charnockite	Sio2 – 50.09% Al2O3 – 2.86% Fe2O3 - 1.09% FeO – 14.12 MgO- 10.62 Cao – 19.62
2	Quartzite	Sio2 – 85.60% Al2O3 – 5.20 % Fe2O3 - 8.20%

The waste generated during the plan period is given below in **Table No- 28**

Table No - 28

YEAR	MINERAL REJECT (Tonnes)	INTERBURDEN (Tonnes)	WASTE (Tonnes)	TOTAL WASTE (Tonnes)
2013-14	**78682**	**240845**	**0**	**319527**
2014-15	**80201**	**111706**	**93199**	**285106**
2015-16	**79860**	**178874**	**11513**	**270247**
2016-17	**79588**	**224699**	**44235**	**348522**
2017-18	**80347**	**212473**	**69774**	**362594**
	398678	**968597**	**218721**	**1585996**

7.2 Selection of Dumping :

Taking into consideration the exploration already carried out, the non-mineralized area has been demarcated. Dumping sites are earmarked on the non-mineralized areas. The dumps are away from the ultimate pit limit. Part of the dumping will be carried out on the existing dumps on the Northern western side and part of the dumping will be carried out on the southern eastern side of the lease area.

In fact the existing dump in the North west side of the lease hold is a very old dump and has been removed as per DGMS instruction for back pushing the benches on the Northern western side for working conveniently at the bottom levels. Whatever remaining is only a small portion of the dump. Hence the question of the dump sliding and going beyond the boundary does not occur.

The dumps are situated on a flat ground. The dumps will be in 3 stages each of 10 m height. The angle of repose of the dump will be 28°. The details of the dumps are given below. The dumping will be carried out in the advancing manner. All the dumps will be re-handled and refilled in the worked out pit after the mineral is exhausted. Ultimately no dump will exist.

7.3 The Maximum Height and Spread of Dumps

Details of existing dump

The waste generated during the earlier scheme period was dumped in waste dumps outside the lease in the Southern side of the lease in the lands belonging to the Company having a dimension of 350 x 250 x 30m & 550 * 200 * 25. However as per the recent guidelines of Indian Bureau of Mines outside dumping is not permitted without NOC from State Government. Hence dumping of waste generated during the Mining plan period will be carried out within the lease area.

DIMENSIONS OF THE EXISITNG DUMP **Table No – 29**

S.No	Location of Dump	Details of area	Dimension (L*W *H) in m
1	Southern side	Outside ML area (Surface right owned by Company)	550 * 200 * 25
2	South eastern side		350 * 250 * 35

Details of proposed dump during the Plan period **Table No – 30**

S. No	Location of Dump	Location of the area	Dimension (L*W *H) in m	Stages	Angle of Repose
1	North western side of the lease (**Dump-A)**	N 540 to N 690 E 00 to E 300	310 * 100 * 30	3	28°

- The dumping will be carried out in 3 stages each of 10m height.
- In order to attain early maturity of dump slopes, the retreating method of dumping is proposed.

7.4 <u>Stacking of Sub grade Material</u> :

- As per the new threshold values, limestone analyzing upto 35% Cao will be utilized by blending or stacked as per the market conditions.
- Similarly high magnesia limestone will be utilized for CEM making.
- Also magnesium limestone obtained from the lease is blended with suitable grade limestone before using in the cement manufacturing as the magnesium limestone cannot be directly used because of its high magnesium content.
- Besides siliceous limestone will also be generated from the lease which will be stacked as sub grade.
- The physical analysis of limestone is not carried out. However the chemical analysis of representative samples of limestone, high magnesia limestone and siliceous limestone i.e sub grade carried out from a NABL accredited lab is enclosed vide **Annexure - 11** and the same is given below in **Table No- 31**

ANALYSIS OF SUB GRADE DUMP **Table No- 31**

S.No	Sample Id	Description	SiO2 %	Fe2O3 %	Al2O3 %	CaO %	MgO %	LOI
1	**D3-A**	Siliceous limestone	18.27	0.16	1.02	37.29	6.45	36.31
2	**D4**	Magnesian Limestone	3.15	0.15	0.51	39.35	12.14	44.13

- Refer **Table No - 32** below for the quantities of sub grade mineral likely to be generated during the plan period,

<u>Summary of Sub Grade generated during Plan Period</u>

Table No - 32

Year	Sub grade (Sil.Limestone)
	(Tonnes)
2013-14	269842
2014-15	163662
2015-16	195763
2016-17	142247
2017-18	155017
TOTAL	926531

- Already accumulated sub grade limestone which is dumped outside the lease area for which the surface right are held by the company as given below in **Table No - 33**.

Details of the Sub grade material available in different stacks, along with dump numbers is given below. This dump is situated outside the lease area in the patta land for which surface rights are held by the company.

Sub-grade dump quantity **Table No - 33**

Sl.NO	Dump No.	Avg Area (m^2)	Avg Ht (m)	Volume (m^3)	Quantity	Remarks
1	Sub grade Dump - 1	10056	17	170952	341904	Sub grade Dump
2	Magnesian Limestone Dump - 1	3741	5	18705	37410	High Magnesian limestone
3	Low grade Limestone Dump - 1	2632.5	4	10530	21060	Low grade/Sub grade limestone
4	Magnesian Limestone Dump - 2	1450	4	5800	11600	High Magnesian limestone
5	Sub grade Dump - 2	12670	14	177380	354760	Sub grade Dump
				383367	**766734**	

Refer Surface Plan (Plate – 3)

7.5 Selection of site for Stacking Subgrade Ore :

Sub grade will be dumped in the southern side of the lease between coordinates N40 to N 145/ E200 to E 615 having a dimension of 410 * 60 * 20 m. The area selected will be sufficient to hold sub grade for the plan period.

7.6 Height and spread of Subgrade stocks :

Dimension of proposed sub grade dump **Table No- 34**

S. No	Location of Dump	Location of the area	Dimension (L*W *H) in m	Stages	Angle of Repose
1	South side of the lease area **(Dump-B)**	N40 to N 145 E200 to E 615	410 * 60 * 20	2	28°

7.7 Precautions To Prevent Runoff In Dumps:

The dump yards shall be located on barren non-mineralized area.

- The dump tops are adequately sloped and water diversion channel shall be provided to prevent erosion & formation of gullies.
- Garland drain along with settling tank is proposed along the toe of the dump
- Earthen banks are provided around the dumps to arrest silt.
- Proper terracing of dump slopes with optimum height shall be made.
- Afforestation on dumps slopes shall be taken up.

CHAPTER – 8

8.0 USE OF MINERAL

8.1 Changes proposed in the use of mineral, if any, with reasons*:*

- Limestone quarried from these mines is mainly supplied to India Cements Limited; at Sankar Nagar factory which is located at a distance of about 10 kms. The average purity of these supplies will be 80 to 84% CaCo3. Typical analysis of limestone in the mining lease area is already mentioned in the earlier sections.
- Magnesium limestone obtained from the lease is blended with suitable grade limestone before using in the cement manufacturing as the magnesium limestone cannot be directly used because of its high magnesium content.
- Part of high magnesium limestone is also sold. Details of the usage of high magnesium limestone is given below.
  - The total production of High MgO Limestone on average is around 38 % of the yearly production i.e. (152738 to 197455 TPA).
  - The total requirement of high magnesium limestone is as follows.
  - Captive consumption for CEM making - 40000 TPA
  - High MgO limestone for sale to surrounding industries - 100000 TPA
  - For blending with limestone - 55000 TPA
  - TOTAL - 195000TPA

8.2 Indicate physical and chemical specifications stipulated by buyers

- The entire limestone produced from the mines will be supplied to India Cements factory situated at a distance of 10 kms from the mines.
- The specifications for consumption in cement industry is as follows

  The NCB has suggested the following broad specifications of the Run – of Mine cement grade limestone.

Oxide Components	**Acceptable range for manufacture of ordinary Portland cement**
Cao%	44 – 52
MgO%	1.5 -2.5 (Max)
SiO_2 }	12.0-14.0
Al_2O_3 }	To satisfy the LSF and SM of the raw mix
Fe_2O_3 }	
$K_2O\% + Na_2O$	< 0.5
$P_2O_5\%$	< 0.5
Cl%	< 0.05
SO_2	< 0.6

- The high magnesia limestone used for Cem making will have CaO in the range of 38-40 %, SiO_2 in the range of 8 -10% and MgO in the range of 6 – 10 %.
- The high magnesia limestone used for blending with limestone will be in the range of 40-42 % CaO, SiO_2 in the range of 10-12% and MgO in the range of 4-6 %.

8.3 Give details in case blending of different grades of ores is being practised or is to be practised at the mine to meet specifications stipulated by buyers:

- As mentioned above the high magnesia limestone used for blending with limestone will be in the range of 40-42 %, SiO_2 in the range of 10-12% and MgO in the range of 4-6 %.
- The siliceous limestone produced from the mine will be stacked as sub grade and will be utilized for blending. However during this five year plan period the sub grade generated will be stacked in the southern side of the lease area.

Details of Existing waste dumps

Table No – 25

Sl.NO	Dump No.	Avg Area (m^2)	Avg Ht (m)	Remarks
1	Waste dump on the Southern side (waste Dump – 1)	110000	25	Waste Dump
2	Waste dump on the South eastern side (waste Dump – 2)	87500	35	Waste Dump

Existing Sub-grade dumps

Table No – 35

Sl.NO	Dump No.	Avg Area (m^2)	Avg Ht (m)	Remarks
1	Sub grade Dump - 1	10056	17	Sub grade Dump
2	Magnesian Limestone Dump - 1	3741	5	High Magnesian limestone
3	Low grade Limestone Dump - 1	2632.5	4	Low grade/Sub grade limestone
4	Magnesian Limestone Dump - 2	1450	4	High Magnesian limestone
5	Sub grade Dump - 2	12670	14	Sub grade Dump

Details of proposed dump during the Plan period **Table No – 30**

S. No	Location of Dump	Location of the area	Dimension (L*W *H) in m
1	North western side of the lease (Dump – A)	N 540 to N 690 E 00 to E 300	310 * 100 * 30

Details of Proposed Sub grade dump **Table No – 34**

S.No	Location of Dump	Location of the area	Dimension (L*W *H) in m
1	South side of the lease area (Dump – B)	N40 to N 145 E200 to E 615	410 * 60 * 20

CHAPTER – 9

OTHERS

9.1 Site Services :

- Rest shelter, Cycle shed, Canteen and First Aid Room have been provided at the mines.
- A qualified doctor is visiting the mine every day.
- An Ambulance van is available all the time.
- Drinking water, rest shelters are provided inside the mines and also at mines office and rest shed for employees working above ground.
- Latrines have been provided.
- Apart from these, there are also store room which maintains minimum spares required for day to day operations.
- Besides Weigh bridge is also installed for weighing the limestone being transported.

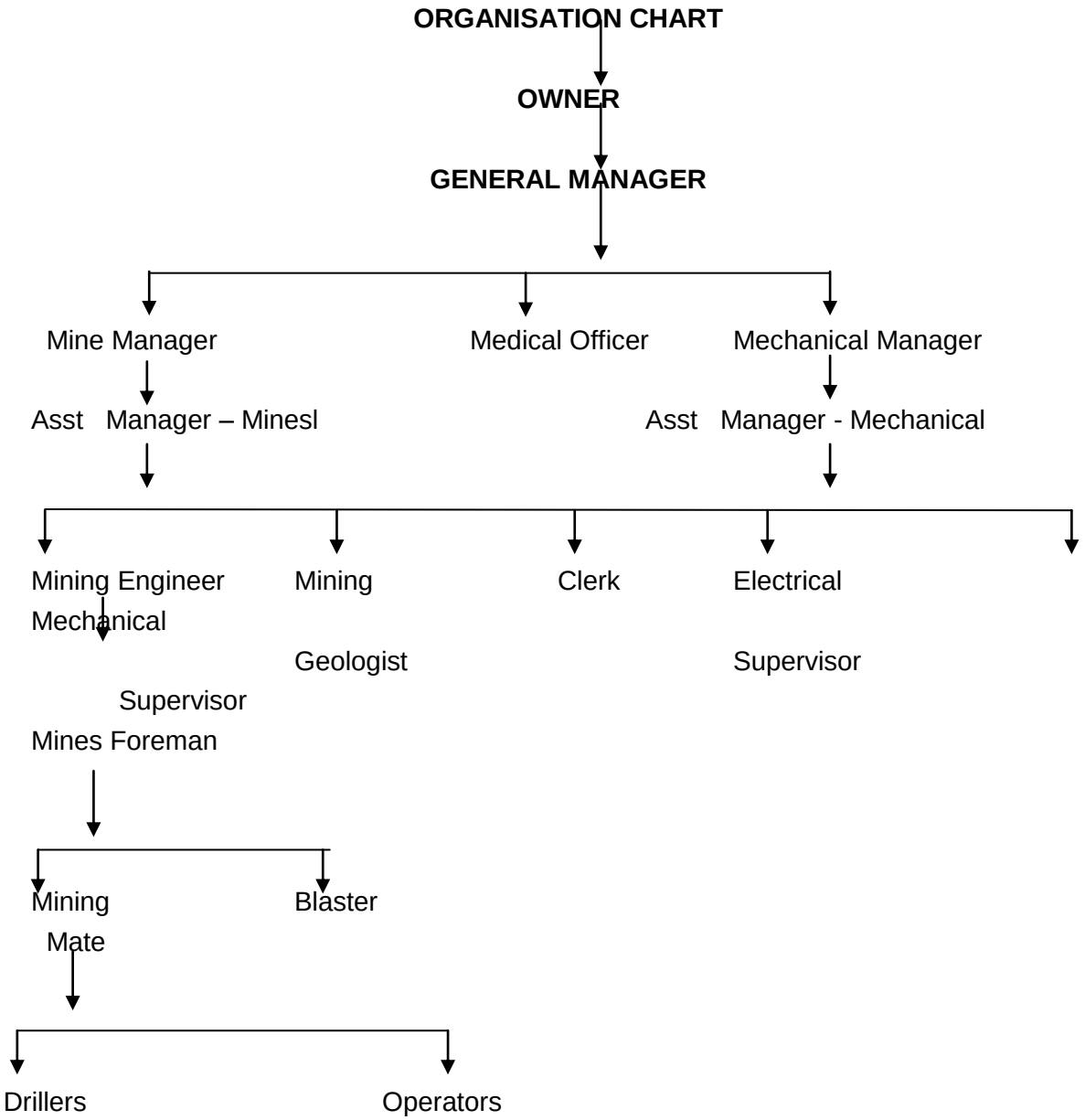
9.2 Employment Potential :

As both leases are working simultaneously the following are the employment potential.

Sl. No.	Staff/Officers	Numbers	
1.	Mines Manager (I class Manager)	-	2
2.	Asst. Mines Manager	-	2
3.	Medical Officer (Part time)	-	1
4.	Asst Manager/Manager – Mechanical	-	2
4.	Mining Geologist	-	1
5.	Mines Foreman	-	2
6.	Mechanical Foreman	-	1
6.	Clerk	-	3
7.	Weigh bridge Attendant	-	2
8.	Electrical Supervisor	-	1
9.	Electrician	-	1
10.	Mining Mate	-	5
11.	Blasters	-	3
	TOTAL	-	26

Skilled Manpower

1.	Operators/Drivers	-	15
2.	Mechanics	-	5
3.	Drillers	-	4
4.	Helpers	-	8
5.	Mazdoors	-	7
		-	39


ORGANISATION CHART
OWNER
GENERAL MANAGER
Mine Manager
Medical Officer
Mechanical Manager
Asst Manager – Minesl
Asst Manager - Mechanical
Mining Engineer
Mining
Clerk
Electrical
Mechanical
Geologist
Supervisor
Supervisor
Mines Foreman
Mining
Mate
Blaster
Drillers
Operators

CHAPTER – 10

10.0 MINERAL PROCESSING

The ROM is transported from mines to crusher situated at the factory site, where separate feeding and crushing arrangements are available. Thus no beneficiation of the limestone is involved except sizing of the quality material to meet the parameters specified for cement manufacture. No chemical beneficiation is proposed /envisaged for the limestone.

CHAPTER – 11

11.0 Environmental Management Plan :

Base Line Information:

The mining plan pertains to the proposed mechanized method of mining and hence requires an EIA & EMP as per IBM's guidelines to obtain the clearances from MoEF. Krishna mines has applied for Environmental clearance which is under process.

The existing environmental data for the following environmental components were collected in the study area:

i. Socio-economic configuration of the area

ii. Micro-meteorological monitoring at one location

iii. Ambient Air Quality study comprising gaseous and particulate matter in
6 different locations in the core and buffer zone.

iv. Water quality analysis in 7 different locations 6 Groundwater and 1 mine pit water

v. Noise levels monitoring in 7 different locations in the core and buffer zone.

vi. Soil quality analysis in 4 locations in the core and buffer zone.

vii. Land use pattern and

viii. Flora & Fauna status

The studies and data collection have been carried out systematically and meticulously as per relevant IS codes, CPCB & MOEF guidelines. The data collected during Winter Season of 2011- 2012 for the parameters are given in this report.

For the purposes of the study, the area has been divided into two zones, namely, core and buffer zones. Core zone covers Mining lease area. The buffer zone covers an area of 10 km radius from the periphery of the ML area.

11.1 Existing Land Use Pattern :

The major activity in the buffer zone of 5 kms radius area from ML is open scrub, waste land, double crop areas besides some small ponds. Most of the lands are agricultural lands besides some government lands.

The area applied for renewal of Mining Lease 31.092Ha. The existing land use pattern of 31.092 Ha. is given below in **Table No - 36**.

Existing Land Use **Table No - 36**

Sl No	Head	Area put on use at start of plan (Ha)
1	Area of excavation	20.71
2	Storage of top soil	Nil
3	Overburden/dump	3.01
4	Mineral Storage/Sub grade	Nil
5	Infrastructure(Workshop/Building)	0.33
6	Roads	0.17
7	Railways	Nil
8	Green belt	1.367
9	Tailing pond	Nil
10	Effluent treatment plant	Nil
11	Mineral Separation plant	Nil
12	Town ship area	Nil
13	Others	Nil
14	Area utilized	25.587
15	Area which will remain (Untouched)	5.505
	Grand Total	31.092

11.1.2. Water Regime :

The water levels measured are ranging from 3 to 12 m BGL in and around/nearby the mining area, whereas the mining operation is going upto 90-100 m below ground level. However, the natural recharge mechanism i.e. recharge to groundwater regime of shallow aquifers is not affected by the existing mining activities. Also, the deeper aquifers are not present in the mining area.

The existing depth of the mine is more than 90 m below ground level, the groundwater recharge taking place in the shallow aquifers (up to 20m) is not getting drained out into mine. The presence of shallow water level is an indication that ground water recharge is not affected due to the mining activity indicating heterogeneous nature of the aquifers present in the area.

11.1.3 Flora and Fauna :

FLORA :

Floristic composition in core zone:

The core zone area of 31.092 Ha. is mostly of hard and rocky areas with undulations. Mine pit also extends over major portion of this area. Plantation also is carried out in this area by the project proponent. The main species found in this area are as follows.

Acacia nilotica, Prosophis, Azadirachta, Albizzia, Calotrophis, Datura, Cuscutta, Tridax, Convolualus, Tephrosia, Aerva, Mullgo, Juncus bufonius, Luzula canprestris and the grasses [ie] *Cyperaceae* family members like *Kyllinga cylindrica, Cloris parpeta species of Pyereus, species of Carex, Fimbristylis uliginosa, Romerca* etc.

Floristic scenario in buffer zone area:

The floristic composition in the buffer zone covering 10 Km. radial area around periphery of core zone, was studied in detail by dividing the entire zone into five transect. Detailed study of various species occurring in each transect was undertaken.

Totally, about 135 species were recorded at the study area. Among the species identified, Acacia *nilotica, Azadirachta indica, Pongamia glabra, Jatropha, Calotrophis, Zizypus, Celosia cristata, Cassia auriculata, Cleome viscose, Cloris parpetta, Ocimum sanctarum, Sida cordifolia, Aerva lanata, Cleome viscosa, Amaranthus viridis, Leucas aspera, Theprosia purpuria, Croton spaciflorus, Tridax procumbens, Citrulus colothinthis, Aristida, Carex sps., Pycreus unioloides, etc*., were dominant with respect to others.

FAUNA: There is no Wild Life Sanctuary or National Park or Biosphere within the study area of 10 km. Also, there is no migratory path of avian fauna exist in the study area. Other than the domesticated animals, jackal (Canis auries), field mouse (Rattus norvegicus), house rat (Rattus rattus), bat (Rhinolopus sp. & Hipposiderus sp.), etc. no wild animals are found in the study area. Amphibians like frogs were mainly in fresh water places. Reptilian fauna is comparatively rich and is mainly restricted to the patches with dense vegetation. Pea fowl is commonly seen in the area.

Birds play an important role in understanding the ecological balance and its interrelationships. The occurrence of birds in various locations largely depends on the site characteristics and their presence in different study sites reveals that there is a good relationship between the birds and other organisms and the environment. The maintenance of the eco-balance could be seen in the selected study areas.

Peafowl is commonly found in the area. This species come under Schedule –I of Indian Wild Life Production Act 1972. However, least disturbance and impact on its existence is ensured, as the mining operations are conducted at deeper level and the blasting noise, etc., will be at minimal quantum. Besides, all environmental production measures for mining impacts are properly implemented. There will be only insignificant impact on the movement factors of Peafowl species.

The mining personal and others in the area are also properly cautioned to cause least disturbance to this species and its existence and movements.

Deer which come under Schdule – III of above Wild Life Production Act 1972, types of Snakes, Porcupine, Mangoose, Anteater, Rabbit etc., are sometimes found in small numbers in Thaliyuthu Thorny Open Scrub Forest. This forest is hardly forming 1.76% of buffer zone area far away from the mine and as such the impact on these species will be quite insignificant due to project operations.

VERTEBRATES: The insects in the study area are interrelated with each other and other organisms. They are in perfect balance in their existence. Some of them act as pests, while others are useful and beneficial to the environment and human beings.

PISCES: The lentic and lotic systems represent common fishes which supports the local people during the seasons.

AMPHIBIANS: The toads and frogs were the amphibians recorded in the study area. Many of them were seen along the Lentic water system and other areas.

REPTILES: The reptiles recorded in the study area include lizards and snakes.

BIRDS: Birds play an important role in understanding the ecological balance and its interrelationships. The occurrence of birds in various locations largely depends on the site characteristics and their presence in different study sites reveals that there is a good relationship between the birds and other organisms and the environment. The maintenance of the eco-balance could be seen in the selected study areas.

MAMMALS: The distribution of mammals is largely dependent upon the environment of the respective areas. The mammals present in the study area include Mongoose, Indian palm Squirrel, etc. These mammals are spread over the study area.

11.1.4 Quality Of Air, Ambient Noise Level and Water :

To establish the ambient air quality, air quality was studied during different periods. Ambient air quality sampling was carried out, with the help of high volume air samplers and repairable dust samplers. Air monitoring stations have been fixed covering the 6 locations. Refer Key plan (**Plate No -1**) and Environmental Plan for locations (**Plate No - 10)**

The 6 stations are fixed at Front side of Mines Office, Nanjankulam village, Vengala Pottal Village, Sethurayanputhur Village, Police Colony and Veppankulam village.

PM_{10} values were in the range of 38.1-92.4 µg/m^3. $PM_{2.5}$ values were in the range of 18.5 to 49.9 µg/m^3. SO2 levels were ranging from 4.2 to7.4 µg/m^3. NOx levels were ranging from 8 to 23.7µg/m^3. While comparing with the NAAQ Norms, all monitored PM_{10}, $PM_{2.5}$, SO2, NOx, and values were found to be well within the respective limit values. The CO values in the all locations found to be below detectable limit. Results are given in **Annexure - 12**.

b) Noise Levels: Noise levels have been monitored during the study period at seven locations. The day Equivalent Noise (Leq-d) level were ranging from 41.2 to 51.9 dB(A) and Night Equivalent Noise (Leq-n) level were ranging from 37.8 to 42.8 dB(A). While comparing with the MOEF Norm of 55 dB(A) for day time and 45 dB(A) for night time, the monitored ambient noise levels were well within the limit values for Residential areas. Results are given in **Annexure – 13.**

c) Water Quality: Seven samples comprising 1 mine pit discharge water and Ground water (6 locations) were collected. The pH value of Mine Pit water was 8.43.TDS and Chloride values were found to be 280 mg/l and 12.3 mg/l respectively. Most of the trace metals were found to be below detectable limits. BOD and COD values were found to be below their detectable limits respectively. The mine pit water quality was found to be within the prescribed CPCB/TNPCB norms for discharge to on land for irrigation.

The ground waters in the bore wells and wells, mostly influenced by nearby ponds or lakes, were found to be good. pH values were ranging in between 7.52 – 7.82. TDS values were in the range of 120 - 1860 mg/l. Chloride values were ranging from 9.5 mg/l to 429.4 mg/l. Iron content was found to be in the range 0.01 – 0.2 mg/l. Trace metals were found to be below their detectable limits. The water quality of ground waters were found to be within the prescribed IS: 10500 Norms for Drinking in the absence of an alternative source. Water quality data is given vide **Annexure – 14**

11.1.5 Climatic Conditions:

The average maximum and minimum temperatures attained in the area will be 35.5 ° to 22.1° C while the relative humidity varied between 31-93%. The wind speed during the study period ranged from <1.8 to 12.6 Km/hr. The predominant wind direction is from NNE/NE.

11.1.6 Human Settlement:

Within the core zone there are no settlements and dwellings, hence disturbance to the dwellings shall not arise due to the mining operations.

Krishna mines is situated in Tirunelveli taluk of Tirunelveli district. Based on 2001 census data, in the 10km radius there are 31 rural villages and 3 urban areas namely Sankar Nagar (Town Panchayat), Naranammalpuram (Town Panchayat) and Tirunelveli Municipality. The total population of these 34 villages is 483567 in which the male population is 238603(49.34%) and the female population is 244964(50.66%). This shows that the male and female population ratio is almost equal.

11.1.7 Public Buildings, Places, of interest and Monuments :

There are no Public buildings, Places of worships & monuments within the core zone or within the vicinity of the mining lease area.

11.1.8 Location of Sampling Stations:

All the monitoring stations are shown in the key plan and environmental management plan enclosed.

11.2. **Environment Impact Assessment** :

11.2.1 Land use pattern:

The land use pattern of the study area falling within 10 km radius around the proposed project area is presented below in **Table No- 37.**

Land use pattern of the study area falling within 10 km radius

Table No- 37

S. No.	Study Area	Geographical Area (ha)	Forest (ha)	Land Under Cultivation		Culturable Waste (ha)	Area not available for Cultivation (ha)
				Irrigated Area (ha)	Unirrigated Area (ha)		
1	0– 3 km	3091.06	8.13	99.59	25.57	2546.93	410.84
			0.26%	3.22%	0.83%	82.40%	13.29%
2	3 – 7 km	11124.91	585.11	576.70	1405.19	5195.82	3362.09
			5.26%	5.18%	12.63%	46.70%	30.22%
3	7-10 km	10468.85	0.0	1355.79	845.34	6381.83	1885.89
			0.0%	12.95%	8.07%	60.96%	18.01%
4	0-10 km	24684.82	593.24	2032.08	2276.10	14124.58	5658.82
			2.40%	8.23%	9.22%	57.22%	22.92%

Forest Land: A total of about 593.24 ha of land in 10 km radius is under forest land use. This accounts to about 2.40% of the total geographical area.

Land under Cultivation: Altogether about 4308.18 ha of land (irrigated and un-irrigated) is put to agriculture and this works out to about 17.45% of the land in 10 km radius of the study area. The land, which is irrigated by source, works out to about 8.23% of total geographical land.

Cultivable Waste Land: This land includes the land, which was cultivated sometime back and left vacant during the past 5 years in succession. Such lands may either be fallow or covered with shrubs, which are not put to any use and all grazing lands and village common lands are also included in this category. The study area comprises of about 14124.58 ha (57.22%) of cultivable wasteland.

Land not Available for Cultivation: All the land not included in the above categories of land uses are considered in the category of land not available for cultivation. This category of land use mainly consists of the hilly and barren lands, human settlements, roads, water-bodies, etc. About 5658.82 ha area working out to about 22.92% of the total study area falls in this category.

11.2.2 Air Quality

In any mechanized mining operations , using the down the hole drilling , heavy earth moving machineries like excavators & tippers , some quantity of dust is bound to be generated depending on the topography , nature of the material handled and climatology parameters like wind speed , wind direction and stability classification of the area viz. location of the buffer zone villages. The deleterious parameters of the air quality to be considered for open cast mine shall be So2, & NOx. From the base line data generated so far, it is found that the ambient air quality is within the permissive limits of CPCB. However a detailed estimation will be made in the EIA & EMP proposed to be submitted after collecting fresh three season data.

11.2.3 Water Quality:

a) Surface water: The surface water in the area is only rainwater passing through dry seasonal nallah. Since limestone is an inert material, there shall be no change in quality of water. But there may be slight increase in the turbidity of water.

b) Ground water: As far as ground water is concerned, it shall not be affected, as the permeability in the rock formations is very poor. The region is predominantly rocky with scanty vegetation and soil cover. The climate is semi-arid and these factors coupled with absence of good aquifers are not conducive to rich ground water resources in the area.

11.2.3.1 Measures for minimizing Adverse Effects on Water Regime :

The source of water pollution will be from the soil wash off emanating from excavated quarry benches and mine areas, from external dumps and pumping of water from the mine sump. To minimize the adverse effects on water regime due to the above activities, the following control measure will be taken.

i) Maintain gradient of 1^{o} or 2^{0} for drainage of water on the bench floors and construction of water drains using local material to prevent wash off and un-controlled descent of water.
ii) Garland drains will be dug around the quarry to prevent rain water draining in to the quarry.
iii) The dumps will be provided with inner slope on top surface and through a system of drains will be allowed to descend in to surrounding drains so as to minimize the erosional effects arising out of uncontrolled descent of water.
Mine sump water will be pumped by suitable pumps mounted at the top of mine sump, 4" delivery G.l. pipes are used to deliver the water up to the plantation point for afforestation work. Hence there will not be any water let outside the premises and the entire pumped water will be used for plantation.

11.2.4 Noise Level:

The noise level of the core & buffer zone have been reported in the base line data which shows that the noise levels are well within the limits as they represent only village activities. All the villages are located more than 500 m from the mining area. The work zone noise levels are less than 90 dB(A) for the people exposed to various mining operations. The DGMS Prescribe exposure limit of 90 dB(A) for workmen in a 8-hour working shift.

The ambient noise levels in most of the cases are well within safe limit of 90 dB (A) prescribed by DGMS for eight hour exposure. However, the following control measures are taken

- Covering the periphery of the mining area and the working area.
- Development of thick canopy of trees will be carried out as a part of afforestation which act as noise attenuators.
- Proper maintenance of the noise generating parts of the machines are introduced air silencers of suitable type which can modulate the noise of the engines of machinery are in use. They will be maintained effectively.
- Ear muffs will be given to those persons operating or working close to any machine generating more than 90 dB (A) levels on continuous basis.

11.2.5 Water Regime:

The topography of the mining area is in general undulating terrain, with the gradual increase in the gradient from the southern side to the northern side. There is a small hillock on the northern side. The mining lease area, surrounding the limestone deposit is contoured and the maximum elevation of the area is 91 m above M.S.L and the minimum elevation is 75 m above M.S.L. There is no natural water course/ nalla/ stream generating or passing through this mining area.

The limestone deposit in the Mining lease area is situated on the southern slope of the Thalaiyuthu quartzite hillock which is running in East West direction. The terrain area has a low relief on the southern side. The area is a rocky terrain with quartzite builders occurring all around and scattered. The area experiences very scanty rain even during monsoon period.

In the buffer zone river Tambaraparani drains for most part of the district, which is perennial in nature. The district has 7 reservoirs 197 canals and 2200 tanks, which serve as surface water irrigation sources. The river Tambarabarani is flowing 8 km SE of the mining lease area. There is no Tambaraparani river canal distribution system present within the mining area. The adjacent lands on southern side are dry lands due to meagre rainfall in this area. The area is neither a catchment area nor watershed or does it have any river/nalla emanating from here.

11.2.6 Socio Economics

- Krishna mines is situated in Tirunelveli taluk of Tirunelveli district.
- Based on 2001 census data, in the 10km radius there are 31 rural villages and 3 urban areas namely Sankar Nagar (Town Panchayat), Naranammalpuram (Town Panchayat) and Tirunelveli Municipality.
- The total population of these 34 villages is 483567 in which the male population is 238603(49.34%) and the female population is 244964(50.66%).
- This shows that the male and female population ratio is almost equal.
- Most of the workers are from the nearby villages.
- The mine has provided direct and indirect employment to the surrounding villagers.
- Due to more than five decades of mining operation, the socio-economic life of the nearby village have been improved with respect to better education, literacy and continuous employment. Some people are engaged in seasonal agricultural activities and thus are not employed fully.

11.2.7 Historical Monuments

There shall not be any impact on any historical monuments as none of them are located within 5 kms radius.

11.3 Environmental Management Plan

11.3.1 Temporary Storage and Utilization of Top Soil:

Since the mine is one of the oldest mine and already opened and limestone exposed, there will not be any generation of topsoil further more. Whatever quantity generated will be used for stabilizing the dumps and for planting trees.

11.3.2 Year-wise Proposal for Reclamation:

Since the limestone beds are steeply dipping and likely to continue more than 120 m deep, concurrent reclamation is not feasible. However part of the pit along section FF' between coordinates N 165 to N 300/E540 to E 640 is used for temporary filling of waste inside the pit during the IV (2016-17)and V year(2017-18) of the plan period as there is not sufficient space within the lease for dumping of waste. This will be re-handled during the next scheme period for carrying out mining operations in that region

At the end of mining operations, the worked out pits can be partly refilled (Upto RL -10) and used as a storage place for water. The villagers could use this water for agricultural and drinking water purposes. Besides the pumped out water is being used for their own farm land. The water body also helps in improving the water table in the open wells in the adjoining areas.

11.3.3 Afforestation Programme:

As per the afforestation programme given in the earlier mining scheme period, it was proposed to cover an area of 1.953 ha.for affoestation. The company has planted about 2625 saplings with a survival rate of 50 % over an area of 1.20 ha including gap filling plantation. The afforestation is carried out near the office building which is situated in the Southern Boundary, part of the dump area on the North western side of the lease. Juliflora, Neem, Teak, Jatropha saplings were mainly planted.

Table No - 6

Year	Area in Ha.	Afforestation Planned as per approval	Extent of Actual plantation (In Ha)	Location	Actual plantation	Remarks
2008-09	Nil	Nil	0.15	On the southern side of the lease and on the Dump in the Northwestern side	350	
2009-10	Nil	Nil	0.35		750	
2010-11	Nil	Nil	0.35		650	
2011-12	0.20	500	0.20		500	
2012-13	0.20	500	0.15		375	
TOTAL	Nil	Nil	**1.20**		**2625**	

It has been proposed to plant about 4750 nos of saplings during the plan period (5 years). These saplings will also be planted along the North western periphery , South western periphery, eastern periphery and on the dump yards on the North western periphery of the lease area. The saplings recommended area Jatropha, Juliflora, Neem, Pongamia, Teak and also fruit bearing trees etc. Expenditure of Rs. 0.65 Lakhs/Ha is proposed towards afforestation. Details of the afforestation proposed is given in **Table No - 38**

Details of the proposed afforestation **Table No - 38**

Year	Area in Ha.	Location	Green belt / afforestation Planned	Species
2013-14	0.21	Along the North western periphery of ML area	525	Jatropha, Juliflora, Neem, Pongamia, Teak
2014-15	0.20	Along the South western periphery of ML area	500	
2015-16	0.30	On the North western dump yard	750	
2016-17	0.90	On the North western dump yard	2250	
2017-18	0.29	Along the eastern periphery of ML area	725	
Total	**1.90**		**4750**	

Note : Green belt will be carried out over an area of 0.7 Ha on the mine peripheries and 1.20 ha of afforestation will be carried out on the dump yard.

11.3.4 Stabilization of the Dumps:

The overburden is dumped in the plan period in the area allotted for the dump yard. The dump will have a height of **30 m** and shall be sloped in 1 in 2. Below the foot of the slopes, a retaining wall of 1.2 m x 1.2 m shall be constructed using waste boulders with a view to contain the loose soil dump. The dump shall be suitably stabilized using hamata grass species and legumes. The slopes shall have contour trenches of 1 m interval where agaves species shall be planted to consolidate the dump. On the dump terraces plantation activity will be carried out.

11.3.5 Measure to Control Erosion/Sedimentation of Water Courses:

The existing watercourses shall not be disturbed and any rainwater falling will be allowed to continue in the same direction and join the natural course. Sufficient check dams shall be constructed in the drainage nallah.

11.3.6 Treatment and Disposal of Water from Mine:

- A sump is created at the lower most level below - 40 RL.
- Any excess rainwater shall be pumped out of the pit with two to three 12.5 HP submersible pumps.

- This water is collected in a water tank and from here it is again pumped out with the help of 50 HP centrifugal pumps.
- This water is being used by the applicant to develop his agricultural farm which is situated 3 kms south of the mining lease.
- Besides water will be used by for dust suppression and afforestation.

11.3.7 Measures for Minimizing Adverse Effects on Water Regime:

Very little coursing of the dry nallah is programmed. The water collected in the sump will be utilised for dust suppression and for afforestation. The excess water being pumped out will be utilized for agriculture farm situated at a distance of 3 kms.

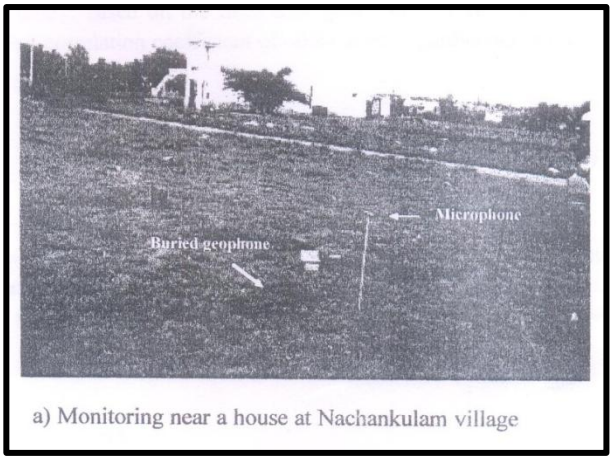
11.3.8 Protective Measure for Ground Vibrations/ Air Blast Caused by Blasting:

The ground vibration due to blasting was studied by D.G.M.S. at different locations and it was well within the limit. Besides the lessee has also carried out blasting vibration studies.

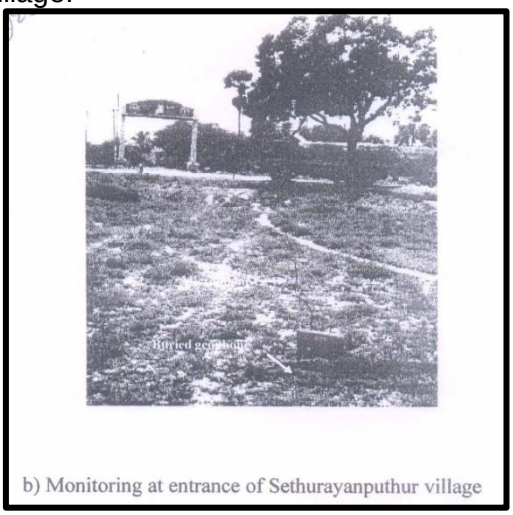
Ground vibration study including air over pressure effects have been conducted by National Institute of Rock Mechanics for Krishna mines. The study results are given below .

11.3.8.1 Field Procedure For Vibrational Study:

The monitoring stations for ground vibration and air overpressure were decided based on the structures present around the mines. Two villages are located around the mine lease area.Sethurayan pudur village is located at a distance of 2.5km South and Nanjankulam is located at about 1,8 km North from the mine. Besides, mines office, canteen, work shop etc., of the lease is located within a distance of 500m from the active working area.. Photo below shows monitoring of ground vibration and air pressure near Nachankulam village and before Sethurayanputhur village.



a) Monitoring near a house at Nachankulam village


b) Monitoring at entrance of Sethurayanputhur village

11.3.8.2 Study Details Of Blasts :

During the field investigation, blast vibration and air overpressure were monitored for eight blasts. The holes were of 115mm in diameter and drilled with crawler mounted drilling machines. The burden and spacing was 3.5m X 3.5m. The number of holes in a blast varied from 10 to 62. The depth of the holes varied from 4.0m to 11.0m and the explosive used was Kelvex 800, Kelvex 500 (83mm dia, 2.78Kg, 40cm long) and ANFO. Drill cuttings were used for stemming the holes. The stemming length varied from 2.0m to 3.0m for different hole depths. The charge per hole varied from 13.6Kg to 67.24Kg depending on the depth of the hole. The maximum charge per delay varied between 132kg to 644 kg and the total charge in around varied between 645kg to 4051kg. All the blasts were initiated with D – cord down the line and short delay electric detonators. The details of the blasts monitored is given below. Presently the mine working is carried out in south benches and as the Nanjankulam village is located in North, for experimental purpose few blasts were taken in northern benches of the mine.

Details of the blast monitored **Table No -39**

Bl.NO	Date	Blast Location	N	D,m	B,m	S,m	CPH, Kg	St,m	TC, Kg	Bl Qty, Cum
1	24.11.2010	4th Bench South E300, N200	30	11	3.5	3.50	67.24	3.0	2017.0	4043
2	24.11.2010	1th Bench South E200, N100	32	10	3.5	3.50	56.68	3.0	1813.8	3920
3	25.11.2010	8th Bench SW E250, N350	62	4	3	3.50	13.6	2.0	809.0	2232
4	25.11.2010	3th Bench SW, E450, N300	14	7	3.5	3.50	33.12	3.0	463.0	1201
5	26.11.2010	6th Bench South	10	10	3.5	3.50	51.68	3.0	516.8	1225
6	27.11.2010	4th Bench SE, N250, E350	27	10	3.5	3.50	52.24	3.0	1410.5	3308
7	27.11.2010	7th Bench NE, N400, E400	24	12	3.5	3.50	64.46	3.0	1547.0	3528
8	29.11.2010	4th Bench South E300, N200	27	11	3.5	3.5	59.24	3.0	1599.5	3638

Note:

N =No of holes, D = Depth of hole, B = Burden, S = Spacing, CPH = Charge per Hole, St == Stemming, TC = Total Charge, Bl Qty = Blasted Quantity

11.3.8.3 Blast Monitoring

Minimate plus seismographs from Instantel, Canada were used for monitoring for ground vibration and air overpressure. These instruments are microprocessor-based, portable units and each unit consists of a standard external transducer for monitoring ground vibration and a mike for measuring air pressure. Eight seismographs were used in this study. Radial distances between the blast and the instrument locations were measured using a binocular type laser based instrument

The details of the monitored ground vibration and air overpressure are given below in **Table No – 40** followed by sample print out**.**

Details of the ground vibration and air overpressure **Table No – 40**

Bl #	SENSOR LOCATION	D (m)	MCD (kg)	SRSD	CRSD	PPV (mm/s)	F (hz)	AOP (dB)
1	Towards Sethurayanputhur Village	202	336.2	11.02	29.06	13.7	20	-
	Towards Sethurayanputhur Village	251	336.2	13.69	31.10	8.71	31.8	-
	Towards Sethurayanputhur Village	300	336.2	16.36	43.15	7.7	19.3	-
	Towards Sethurayanputhur Village	350	336.2	19.09	50.34	3.57	15.8	118.8
	Towards Sethurayanputhur Village	400	336.2	21.82	57.34	3.18	29.5	118.8
	Towards Sethurayanputhur Village	466	336.2	25.41	67.03	3.56	20.5	117.1
	Towards Sethurayanputhur Village	515	336.2	28.09	74.08	3.36	20.3	-
	Near entrance of Sethurayanputhur Village	1016	336.2	55.41	146.14	0.54	58.6	105.5
2	Towards Sethurayanputhur Village	155	226.72	10.29	25.42	11.2	31.8	-
	Towards Sethurayanputhur Village	205	226.72	13.61	33.63	9.2	32	-
	Towards Sethurayanputhur Village	255	226.72	16.94	41.83	5.89	26.9	-
	Towards Sethurayanputhur Village	305	226.72	20.26	50.03	5.94	21.8	129
	Towards Sethurayanputhur Village	355	226.72	23.58	58.23	3.73	22	127.9
	Towards Sethurayanputhur Village	421	226.72	27.96	69.06	3.04	22	126.3
	Towards Sethurayanputhur Village	471	226.72	31.28	77.26	3.03	21.8	-
	Near entrance of Sethurayanputhur Village	1221	226.72	81.09	200.28	No vibration	-	-
3	Near entrance of Sethurayanputhur Village	1486	208	103.04	250.85	No vibration	-	-
	Near Magazene	484	208	33.56	81.70	1.16	16.5	-
	Towards Nanjankulam Village	734	208	50.89	123.90	No vibration	-	-
	Towards Nanjankulam Village	794	208	55.05	134.03	- do -	-	-
	Towards Nanjankulam Village	854	208	59.21	144.16	- do -	-	-
	Towards Nanjankulam Village	914	208	63.37	154.29	- do -	-	-
	Towards Nanjankulam Village	974	208	67.53	164.42	- do -	-	-
	Near Nanjankulam Village	1944	208	134.79	328.16	- do -	-	-
4	Near entrance of Sethurayanputhur Village	1406	132.40	122.19	275.91	No vibration	-	-
	Near Magazene	241	132.40	20.94	47.29	4.16	36.3	-
	Towards Nanjankulam Village	491	132.40	42.67	96.35	0.83	17.3	-
	Towards Nanjankulam Village	551	132.40	47.89	108.13	0.93	30.3	-
	Towards Nanjankulam Village	611	132.40	53.10	119.90	0.78	17.5	106
	Towards Nanjankulam Village	671	132.40	58.31	131.67	0.58	17.8	106
	Towards Nanjankulam Village	731	132.40	63.53	143.45	0.75	20.3	-
	Near Nanjankulam Village	1701	132.40	147.83	333.79	Not	-	-
5	ANFO Mixing Shed	359	516.80	15.79	44.74	9.8	22.1	-
	Near Mine Office	382	516.80	16.8	47.61	8.26	23.8	-
	Near WeightBridge	418	516.80	18.38	52.10	8.24	24.3	-
	Near Magazene	210	516.80	9.23	26.17	18.7	17.3	-
	Towards NK Village	421	516.80	18.52	52.47	5.36	12.0	118.1

Bl #	SENSOR LOCATION	D (m)	MCD (kg)	SRSD	CRSD	PPV (mm/s)	F (hz)	AOP (dB)
	Towards NK Village	481	516.80	21.16	59.95	4.27	12.8	118.2
	Towards NK Village	541	516.80	23.8	67.43	5.17	12.8	117.5
	Near Nanjankulam village	1511	516.80	66.47	44.74	Not	-	-
6	ANFO Mixing Shed	183	313.44	10.34	44.69	8.2	23.5	-
	Near Mine Office	243	313.44	13.73	45.04	7.42	43.3	-
	Near WeightBridge	287	313.44	16.21	47.01	3.69	35.8	-
	Near Magazene	330	313.44	18.64	16.67	4.23	16.8	-
	Towards ICL Mine(East)	324	313.44	18.30	42.15	4.51	28.8	127.4
	Towards ICL Mine(East)	364	313.44	20.56	49.09	3.96	16.5	126.8
	Towards ICL Mine(East)	404	313.44	22.82	56.04	3.07	17.5	124.8
	Near Nanjankulam village	1747	313.44	98.68	168.36	Not	-	-
7	ANFO Mixing Shed	348	451.22	16.38	45.38	7.81	22.0	-
	Near Mine Office	382	451.22	17.98	49.81	4.15	25.0	-
	Near WeightBridge	380	451.22	17.89	49.55	4.26	35.0	-
	Near Magazene	189	451.22	8.90	24.65	11.3	24.8	-
	Towards ICL Mine(East)	440	451.22	20.71	57.38	6	38.0	119.6
	Towards ICL Mine(East)	480	451.22	22.60	62.59	4.42	21.8	118.3
	Towards ICL Mine(East)	520	451.22	24.48	67.81	4.33	22.8	117.5
	Near Nanjankulam village	1582	451.22	74.48	206.30	No vibration	-	-
8	Near ANFO Mixing Shed	150	355.44	7.96	21.18	38	41	-
	Towards Sethurayanputhur	350	355.44	18.56	49.42	10	39.8	-
	Towards Sethurayanputhur	410	355.44	21.75	57.89	4.89	38	-
	Towards Sethurayanputhur	460	355.44	24.40	64.95	3.96	24.5	-
	Towards Sethurayanputhur	510	355.44	27.05	72.01	2.81	23.8	116.1
	Towards Sethurayanputhur	560	355.44	29.70	79.07	2.67	22.5	114.6
	Towards Sethurayanputhur	610	355.44	32.36	86.13	2.65	22.3	114.4
	Near Natrajan CEM plant	966	355.44	51.24	136.40	3.13	19	102.8

Note: - D: Distance, MCD: maximum charge per delay, SRCD: Square root scaled distance, CRSD: Cube root scaled distance, PPV: Peak particle velocity, F: Frequency, AOP: Air overpressure, NOT: Not over instrument threshold of 0.51mm/s

Instantel

Event Report

Date/Time	Vert at 14:56:43 November 24, 2010
Trigger Source	Geo: 0.510 mm/s
Range	Geo: 254 mm/s
Record Time	3.75 sec (Auto=3Sec) at 2048 sps
Notes	
Location:	Sethurayan Puthur,Tirnelveli, Tamil Nadu
Client:	Krishna Mines.
User Name:	RB & EE, NIRM
General:	Vib & AOP study at Krishna Limestone

Extended Notes

Microphone	Linear Weighting
PSPL	91.5 dB(L) at 0.109 sec
ZC Freq	30 Hz
Channel Test	Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	8.76	7.11	9.91	mm/s
ZC Freq	34	28	21	Hz
Time (Rel. to Trig)	0.187	0.165	0.210	sec
Peak Acceleration	0.212	0.186	0.212	g
Peak Displacement	0.0390	0.0423	0.0744	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.9	3.8	3.9	

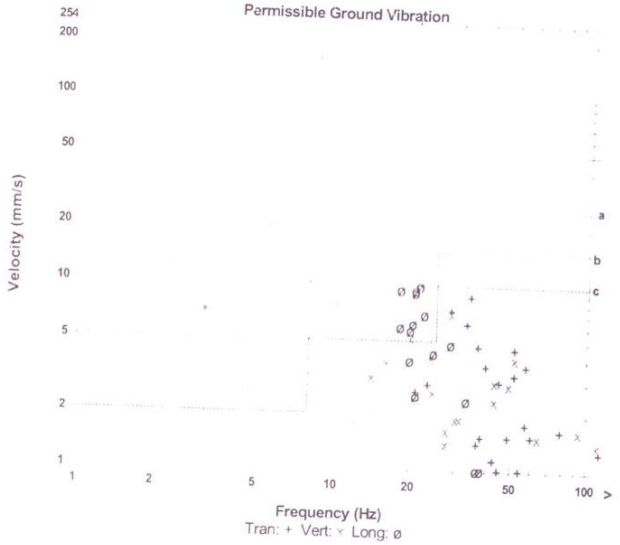
Peak Vector Sum 13.7 mm/s at 0.188 sec

Serial Number	BE9036 V 10.02-8.0 MiniMate Plus
Battery Level	6.3 Volts
File Name	K036DIJY.UJ0

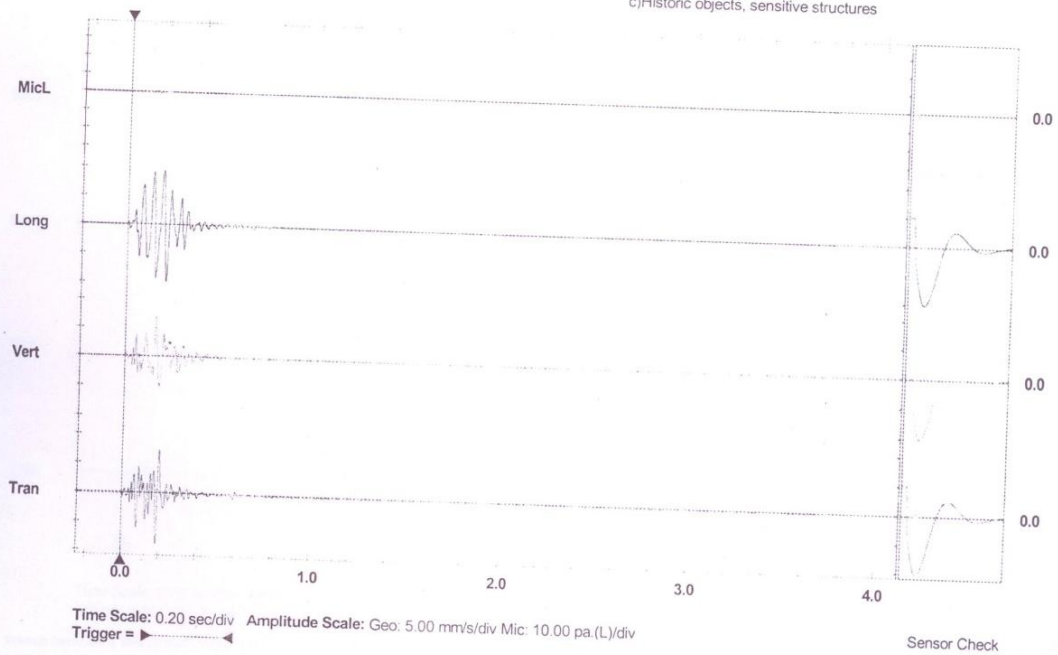
Post Event Notes
Blast No 1, Blast location is 4th bench south, Monitored Towards Sethurayan Puthur village at a distance of 202m.

DGMS India (A)

Permissible Ground Vibration



a)Industrial Buildings
b)Domestic houses/structures
c)Historic objects, sensitive structures



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Printed: December 6, 2010 (V 10.02 - 10.02)

Format (c) 2006-2009 Instantel, a division of Xmark Corporation

B-1

11.3.9 Measure for Protecting Historical Monuments and for Rehabilitation of the Habitat:

No historical monuments are located within 5 kms distance and hence need of protecting does not arise. However, steps to be taken are already mentioned above to reduce the vibrations due to blasting.

11.3.10 Socio-Economic Benefits Arising from Mining:

The project would help to employ more than 150 people by direct and indirect employment. The lessee shall extend social benefits like drinking water health care measure, educational benefits to the neighboring villagers in addition to his own employees.

The State and Central Governments will also get benefited in the form of revenues/ royalties, excise, taxes and cess etc. Ultimately the limestone mining forms the basic activity for the cement plant, which will benefit many people directly & indirectly who are depending upon for their livelihood, for a number of years to come.

11.3.11 Monitoring Schedules for Different Mining Activities:

The lessee as per the DOE guidelines in respect of air, water, noise & vibrations, soil quality etc shall undertake the monitoring of Environmental parameters. A suitable proposal will be made in the Comprehensive EIA & EMP report. Already about 8.00 lakhs (Refer **Table No - 41**) was spent for the monitoring of different environmental issues and the same will be continued.

Environmental cost for Krishna Mines **Table No -41**

(Rs. in lakhs)

Sl. No.	Activity	Recurring Cost /Annum
1	Dust suppression	2.00
2	Green belt and afforestation	1.00
3	Monitoring of Environmental quality	2.00
4	Occupational Health & Hygiene	1.00
	Total	**8.00**

Any Other Information

The production of limestone shall be enhanced if any need of requirement arises. There are proposals to enhance the rated capacity of the existing cement plant in the near future and required permissions and modification to the plan will be obtained as per statutory requirement as and when required.

CSR Activities

Krishna Mines has adopted proper implementation of their corporate social Responsibility (CSR) programmes as a strategic and prime corporate motto. The company treats CSR as not only philanthropy, but as an important Corporate Mission and have carried out socially beneficial developmental activities in all peripheral areas of local community near to their operating mines. In this project also, which is being operated for past many years, the project proponent have carried out beneficial social welfare activities to greatly improve the social and physical infrastructure of the local area. Elaborate details in this respect are profiled below. Many of the under mentioned welfare measures are also being implemented presently in a progressive manner from the past. The measures are largely designed on need based aspirations of local villagers.

Some of the salient CSR activity carried out is listed below

a) Undertaken good social welfare activities in nearby villages of Nanjankulam, sethurayanpudur, Ramayanpatti and Thalaiyuthu for providing computers, provision of school uniforms, transport qualities and provision of borewell for the TDTA middle school at Nanjankulam. The total amount spent is about Rs,74550/-. The split details in this report is given in below.

SOCIAL ACTIVITIES AT SCHOOLS

TDTA MIDDLE SCHOOL NANJANKULAM

1. Computer with Table	:	Rs.	16550
2. Bore Hole & Accessories for Drinking Water	:	Rs.	25500
3. School Uniforms for Children's (104 Nos)	:	Rs.	28000
4. Table & Chair	:	Rs.	3500
5. Transport	:	Rs.	1000
TOTAL	**:**	**Rs.**	**74550**

b) R.C. Primary school at Nanjankulam have been provided with following facilities

	ITEM	COST Rs.
(a)	TV/DVD player	8200/-
(b)	Book shelves	27500/-
(c)	School uniforms for 138 children	36900/-
(d)	Table and chairs for children	18000/-
(e)	Floor mats	1850/-
(f)	Transport	550/-
	Total	**93000/-**

c) M/s Krishna Mines have also contributed towards expenses for school functions. The total amount spent for this is Rs. 23300/-.

From the above description, it can be seen that the project proponent has already spent Rs. 196720/- for various welfare activities to the local community. In future also, such welfare measures under CSR activities will be under taken.

A qualified doctor visits the mine every day. His services are also extended to nearby villages. Besides, an ambulance van is available all the time for use in the mine as well as for nearby villagers.

Future Proposal:

In future the following social welfare activities will also be undertaken by project authorities to improve the physical and social infrastructures of the local community.

- Roads in the villages shall be repaired and maintained.
- Educational facilities shall be improved.
- Implementation of effective rainwater harvesting system.
- School books & uniforms for poor people shall be provided. Meritorious poor children shall be provided scholarships.
- Financial assistance for conducting local sports, religious and cultural activities.
- Proper drinking water supply shall be provided and regular chlorination of drinking water shall be done..
- Frequent Medical camps will be conducted for the benefit of villagers.
- Awareness programme for the villagers on sanitation, improvement in health standards, birth control. Malaria eradication, HIV prevention, etc, shall be conducted.

Every year from both the mining lease, Rs. 10 lakhs will be spent under CSR. The breakup of the same will be decided based on the immediate need and priority.

PROGRESSIVE MINE CLOSURE PLAN SUBMITTED UNDER RULE 23B(3) OF AMENDED MCDR, 2003 FOR RC.NO8480/MM4/2002 (G.O. M.S. NO. 1081- OLD)

Introduction:

Krishna Mines is situated in Ramayanpatti village in Tirunelveli Taluk and District in Tamil Nadu. This mine is supplying major portion of limestone to M/S. The India Cements Limited, at Sankar Nagar for their modernized dry process cement plant.

The mining Lease covered under G.O.M.S. 1081 dated 2-9-1983 was originally granted vide G.O.M.S. 2557 dated 10-5-1962 for a period of 20 years from the period of Lease deed execution on 28-1-1963 and the lease expired on 27-1-83. When the application was filed for first renewal, the renewal was granted only for six years. The applicant appealed through revision application to the central government requesting the lease period to be extended up to twenty years. Finally the Government of Tamil Nadu after obtaining the final order from Central government extended the mining lease period to twenty years from 28-01-1983 which got expired on 27-1-2003.

After that the applicant has also submitted an application for second renewal, dated on 23-1-2002 for which mining plan was prepared and got approved vide No TN/TNL/MP/CST/1452/2 dated 19-12-02 up to 2007-08. Subsequently the mine plan was modified to capitalize good market for High magnesium limestone and also for pink limestone and the modified mine plan was approved vide Lr.No TN/TNL/MP/CST/1610/SZ dated 12.08.2005.

The existing mining scheme was approved vide letter **No TN/TNL/ LST/MS-602-SZ dated 31.01.12.**

Details of the lease

S.No	G.O.Ms.No & Date	Extent (Ha.)	Villages	Period of lease
1)	G.O.Ms.No – 1081 Dated 02.09.1983	31.092	Ramayanpatti	20 years
2)	Rc.No8480/MM4/2002	31.092	Ramayanpatti	10 years Valid upto 27.01.2013

- The **G.O.Ms.No – 1081** was applied for renewal letter dated 23.01.2002.
- The Second renewal was granted vide letter Rc.No.8480/MM4/2002 dated 11.06.04 with effect from 28.01.2003 to 27.01.2013 valid for 10 years only.

- The lease deed has been executed.
- Although the lessee wanted renewal for 20 years lease renewal was granted for 10 years only. Copy of Mine lease deed is enclosed Vide **Annexure – 1.**
- Hence the lessee has applied for renewal of the lease on M2/3239/2012 dated 24.01.2012. Copy of the renewal application and its acknowledgement are enclosed vide **Annexure 2 & 2A.**

a) Name of Lessee and Address : **KRISHNA MINES**
23, Sripuram,
Tamilnadu

State : Tamilnadu
Pincode : 627 001.
Phone : 0462-2333200
Fax : 95462-2339248

The location of mining lease area is shown in Key Plan **Plate no.1**

1.0 Details of Mining Leases:

The applicant company is having two mining leases from which they are supplying limestone to M/s The India Cements Limited, Sankarnagar. The details of the Mining lease is given below.

Details of Mining Lease

S.No	G.O.Ms.No & Date	Extent (Ha.)	Villages	Period of lease
1)	**G.O.Ms.No – 1081 Dated 02.09.1983**	**31.092**	**Ramayanpatti**	**20 years**
2)	**Rc.No8480/MM4/2002**			**10 years Valid upto 27.01.2013**

There is one more mining lease under G.O.Ms.NO -48 / 115 over an extent of 12.12 ha. which is adjacent to the above said one and both the leases are being worked continuously.

Location and extent of mining Lease area:-

Krishna mines are located in Ramayanpatti village of Tirunelveli Taluk, Tirunelveli District. The distance from the mining lease area to India Cements Plant is about 8 Kms.

Type of lease area:-

The Mining Lease falls in private lands belonging to the lessee. The area is being worked from a long time and is devoid of any vegetation and full of rock exposures. The area is being worked out continuously for more than 5 decades.

Method of Mining:-

The method of working is opencast fully mechanized mining using deep hole drilling and blasting & HEMM equipments considering various technical parameters like surface topography, continuation of limestone deposit, quality variations, geo-technical aspects, required rate of production etc. It is proposed to work this deposit by adopting 10.0 m bench height and width of more than the height of benches i.e. more than 10 m, with an ultimate pit slope of 45°. The ramp gradient shall be kept minimum of 1 in 16.

Mineral Processing operation:-

The ROM is transported from mines to crusher situated at the factory site, where separate feeding and crushing arrangements are available. Thus, no beneficiation of the limestone is involved except sizing of the quality material to meet the parameters specified for cement manufacture. No chemical beneficiation is proposed /envisaged for the limestone.

1.1 Reasons for mine closure: - (Progressive)

Normally for closure of mining operation the following are the important factors

1. Exhaustion of Mineral
2. Lack of Demand
3. Uneconomic operation
4. Natural calamity
5. Directives from statutory authorities or court.

As per the estimates a reserves/resources of about of 13.61 Mil.T has been established the details of which is given under Chapter 3.0 para 3.4 of the Mine plan.

The average production is going to be around 0.45 MTPA which means around 2.26Mil.T during the present plan period. Even during the conceptual period the production is going be around 0.45 MTPA which means about 2.25Mil.T for five year period.

Mining will be continued up to 22.6 years including the present plan period with the capacity of production mentioned above. Hence, the closure of the mine will not take place during the present plan period since the mineral is not exhausted.

The mine will be refilled along AA' to DD' between N 75 to N 490 and E 15 to E 435 upto 10 RL. Refilling of mine exhausted area will commence from II Scheme period i.e from 2023-28 onwards. During the current plan period also part of the area is shown temporary refilling due to shortage of waste dump area. After exhaustion of the pit upto -40 RL along Section AA', BB' and CC' the temporary waste dump storage shown along Section EE' and FF' on mineralized area will be rehandled and mining will continue upto 10 RL. The successive advancement of the pit at the end of conceptual period is depicted in the conceptual mining plan and conceptual section vide **Plate no. 8 & 9.**

Reclamation of the dumps will also be undertaken as a part of reclamation. The above progressive closure plan is being given based on the proved reserves available.

1.2 <u>Statutory obligation</u>:-

The lease is in operation since 1963. The lessee right now is not bound by any legal obligations, like special conditions imposed while execution of lease deed, approval of mining plan, directives from Indian Bureau of Mines, conditions from the Ministry of Environment and Forests, State of Central Pollution Control Board or by any other organization.

The applicant will carry out mining operations as per provisions of the Mines Act – 1952, MMR – 1961, MCR- 1960 and MCDR – 1988 and other rules framed by Central and State Government as applicable from time to time for an 'A' category mines.

- The lease is in operation since 1963.
- Systematic and scientific development of mines is being carried out for sustainable development of mineral deposit,
- Community development is being carried out giving preference to the nearby villagers namely Ramayanapatti, Sethurayanpudur, Najankulam, Thalayathu for employment, donation for children education for purchase of books, uniform etc. Road development work in nearby villages during monsoon season, Drinking water facilities by drilling bore wells and deepening of water storage ponds, leveling works at villages with waste material, donation for temple construction and other development work. Street light fittings for village roads, Donation and material for orphanage centre, providing free food to school children etc.
- No rehabilitation of affected persons is involved in the project.
- Reclamation of the mined out land by back filling and afforestation is proposed as a part of restoration of the mined out land which will commence after the mineral is exhausted.
- Royalty and taxes are being paid to the Government regularly.

1.3 Progressive Mine closure plan preparation:-

a. **Name and address of the applicant**:

KRISHNA MINES
23, Sripuram,
Tamilnadu

State	:	Tamilnadu
Pin code	:	627 001.
Phone	:	0462-2333200
Fax	:	95462-2339248

b. Closure Plan Preparation:

Name and Address of RQP
M.S.Jayaram
New No – 49, Old No – 23
Umapathy Street
West Mambalam
Chennai – 600 033.
Registration No: RQP/MAS/173/2003/A valid upto 09.07.2013
Ph – 044 -24722195, Mob- 9952961106

c. Name of the Executing Agency

Krishna Mines
23, Sripuram,
Tirunelveli.

2.0 Mine Description

2.1. Physiography:

The Mining lease area is almost a flat terrain on the southern side with a gradual raise in contours on the northern side. There is a small hillock on the northern side. There is no natural water course passing through this area. However waste rock bund has been formed on the northern side to prevent rain water flow entering inside the mine pit. There is no forest land in and around the areas. There is no other important surface feature such as public monuments, place of interest etc., within 5 km radius of the mining lease area. The mine is flanked both on eastern side and western side by mines of M/s. The India Cements Limited. The adjacent land on the southern side is also dry land due to meager rainfall in this area. The mining lease area, surrounding the limestone deposit is contoured.

2.1.1. Regional Geology :

The rocks in this region are metamorphosed crystalline limestone and associated gneiss and quartzite of Archaean age. Due to intense metamorphism these formation are seen as heterogeneous assemblages of metamorphic facies. The arenaceous facies are represented by quartzite, argillaceous facies are represented by calcgnesiss and calcareous facies are represented by magnesium limestone and crystalline limestone.

2.1.2. Local Geology:

The limestone deposit of Krishna Mines belongs to Archaean age and represents the metamorphosed sediments of Dharwarian period and forms part of the major Ramayanpatti limestone band, which traverses in the East West direction and for about 3 Kilometers. This is one of the most important limestone formations of Tamilnadu. Many of the captive mines of India Cements Limited, South India Mines and Minerals Industries Limited and Krishna Mine are located in this limestone band. Limestone is seen occurring as a linear body in the Mining lease area. It is narrower in the eastern side and gets wider on the western side. The width of the limestone band varies from 40 to 50 m in Western Part where as it is 20 m to 40 m in the eastern part. Limestone band is striking in East- West direction. The dip direction is towards south. The angle of dip is 80^0 due south. This limestone is flanked by kankar followed by quartzite with kankar patches and magnesium limestone. Intermittent charnockite patches could be observed the contact rocks are also dipping in the same direction. The limestone occurs as fine grained, medium grained to nearly coarse grained calicle crystals. The colour also varies from white, yellow honey yellow, blue and pink with varying gradation in physical and chemical characteristics. The general sequence and rock formation from foot wall (North) to hanging wall (south) sides are given below.

↑ Quartzite
Kankar
Limestone
Magnesian Limestone
Siliceous Limestone
Charnockite

The quality of limestone is generally good as the chemical analysis of the Limestone is as follows

Table No -7

Cement Grade Limestone			**Magnesium Limestone**		
Caco3	-	84.9	Caco3	-	72.8
MgCo3	-	1.8	MgCo3	-	14.2
Sio2	-	9.4	Silica	-	11.5
Cao	-	48	Cao	-	40
Mgo	-	1	Mgo	-	7.1
R203	-	3.2	R203	-	1.0
Loss on Ignition	-	37.6	Loss on ignition	-	40.8

Reserves:

For the purposes of estimation of reserves, cross sectional method has been followed (Cross sectional area x Length of influence in metres x tonnage conversion factor). Six geological cross sections are drawn on the grid lines with equal section interval of 100 metres. Reserves have been calculated upto a depth – 40 RL. Refer **Plate- 5** for Geological Cross section.

For the calculation of the geological reserves a recovery percentage of 85% and the tonnage conversion factor of 2.5 is assumed. The reserve estimation was done up to – 40 R.L, i.e. up to a depth of 120m.

The lessee has two mining leases, namely G.O.No.1081 and G.O.No.115 which are being worked simultaneously, for all practical purposes. However the reserves for both the leases have been estimated separately.

The cement grade limestone has been classified on the basis of CaO and MgO content of limestone, which could be used in the process of manufacturing cement and for CEM. The gross reserves for limestone, which are mainly white and pink limestone within mining lease, was estimated. Besides High Magnesium limestone which has good market in various industries and can also be blended with high grade limestone and used in cement manufacture is also considered for reserve estimation.

The **Geological & Mineable Reserves as 30.06.2011(As given in previous scheme of Mining) is 14.93 Mil.T and 14.375 Mil.T.**

The reserves estimated above are as on 30.06.2011. The production during the last 2 years of the scheme period i.e 2011-12 & 2012-13 (upto end of Nov 2012) was reduced from already estimated reserves to arrive at the residual reserves.

The quantity of limestone produced from the mines during 2011-12 & 2012-13(upto end of Nov – 2012) is 619192 Tonnes. Hence the residual mineable reserve is 11852539 Tonnes or 11.852 Mil.T.

However as a cross check the reserves were again estimated based on the cross section and the residual reserves were arrived. The same has been given in the following paras.

Limestone and High magnesium limestone **Table No - 11**

Classification	Code	Quantity (In tonnes)	Grade
1	2	3	4
Total mineral Reserves (A+B)			
A. Mineral Reserve			+35% CAO
1. Proved Mineral Reserve			
a. Limestone	111	**6282013**	
b. High. Mg. Limestone	111	**3910877**	
2. Probable Mineral Reserve			
a. Limestone	121 & 122	Nil	-
b. High. Mg. Limestone	121 & 122	Nil	-
B. Remaining Resource			
1. Feasibility Mineral Resource	211	Nil	-
2.Prefeasibility Mineral Resource	221 & 222		-
a. Limestone		**1159393**	-
b. High. Mg. Limestone		**1033703**	-
3.Measured Mineral Resource	331	Nil	-
4.Indicated Mineral Resource	332	Nil	-
5.Inferred Mineral Resource	333		
a. Limestone		**395463**	
b. High. Mg. Limestone		**829600**	
6.Reconnaissance Mineral Resource	334		
		13611047	

2.3. Mining Method:

2.3.1 Salient Features of Mining:

The method of working is opencast mechanized mining considering various technical parameters like surface topography, continuation of limestone deposit, quality variations, geo-technical aspects, required rate of production etc., It is proposed to work this deposit by adopting 10.0 m bench height and width of more than the height of benches i.e. more than 10 m, with an ultimate pit slope of 45°. The benches shall be 10.0 m in height and the ramp gradient shall be kept minimum of 1 in 16.

Mining is being carried out by open cast method. Systematic mine development and winning of limestone mineral is planned taking into consideration the present economic mineable depth of 120 m in this mine. Based on the disposition and the width of the limestone body, the ultimate pit limit of is arrived accordingly.

The side wall development will be carried out with the help of deep hole drilling, blasting and excavation by shovels in combination with dumpers. During production in limestone deep hole drilling and blasting will be adopted. Rock breaker will be used for breaking of oversize boulders. Limestone benches will form slices of 5m and will be merged as 10m as the bench reaches the side wall.

The side wall development will be carried out with the help of excavators, dumpers and dozer and the height of the benches in development is being maintained as 10m, which would be the safe working height of shovels deployed. Specific permission from Directorate of Mines safety has been obtained for adopting a system of deep hole blasting and for working with the help of heavy machinery for digging, excavation and removal of ore etc. under regulation 106 (2) (b) of Metalliferous Mines Regulation 1961.

2.3.2 Extent of Mechanization:

List of Mining Machinery:

The following table shows the list of mining machinery is under use for both leases.

Table No - 27

Sl. No.	Equipment Drilling - Compressor	Capacity	Units	Output per Hour
1.	CPT – 300 -Compressor	100 P.S.I.	1	
2.	ATLAS COPCO Compressor	150 P.S.I	1	
3.	DTH WAGON DRILL	115mm dia	2	10 Mt/Hr
4.	JACK HAMMER RH 656	32mm dia		8mt/Hr
5.	L & T poclain	CK - 300	2	294 Cu.m/hr
6.	L & T Komatsu	PC -210	1	196 Cu.m/hr
7.	Dumpers (Terex/HM/BEML)	25 Ts	4	
8.	Tippers	20 Ts	9	20T/Hr(Prodcution) & 80T/hr(Development)
9.	D8 Dozer	220	1	
10.	Submersible pump	12.5 H.P	1	
11.	Centrifugal pump	50 H.P	1	
12.	Jeep		1	

2.3.3 Production Level:

The mining plan is being submitted under Rule 24 of MCR-1960. Mining is being carried out by open cast method. Systematic mine development and winning of limestone is planned up to a depth of 115 m in this mine i.e. up to – 40RL which is considered as

economical mining limit. Based on the disposition and the width of the limestone body, the ultimate pit limit is arrived accordingly.

The mine is worked along the strike of limestone in the East- West direction.

The mine being worked at present has a dimension of 625 m x 525 m and the present working is at - 10 R.L

On the hang wall side (Northern side) major development is done on the North western side along section AA', BB' and CC'. The major development is to push the benches of Charnockite and siliceous limestone to work the bottom benches.

On the footwall side (Southern side) major development is done on the North western side along section DD', EE' and FF'. Here also the major development is to push the benches of Charnockite and siliceous limestone to work the bottom benches.

The side wall development will be carried out with the help of deep hole drilling, blasting and excavation by shovels in combination with rear dumpers. During production of limestone deep hole drilling and blasting will be adopted. Rock breaker will be used for breaking of oversize boulders. Limestone benches will be slices of 5m and will be merged as 10m as the bench reaches the side wall.

The side wall development will be carried out with the help of shovels, dumpers and dozer and the height of the benches in development is being maintained as 10m, which would be the safe working height of shovels deployed. Specific permission from Directorate of Mines safety has been obtained for adopting a system of deep hole blasting and for working with the help of heavy machinery for digging, excavation and removal of ore etc. under regulation 106 (2) (b) of Metalliferrous Mines Regulation 1961.

Year wise development for the ensuing 5 years period:-

Table No - 18

Year	Limestone	Magnesian Limestone	Total Production	Mineral Reject	Sibeburden	Interburden	Total waste	Sub grade (Sil.Limestone)
	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)
2013-14	271262	174608	445870	78682	0	240845	319527	269842
2014-15	297228	157242	454470	80201	93199	111706	285106	163662
2015-16	271530	181008	452538	79860	11513	178874	270247	195763
2016-17	298262	152738	451000	79588	44235	224699	348522	142247
2017-18	257842	197455	455297	80347	69774	212473	362594	155017
TOTAL	**1396124**	**863051**	**2259175**	**398678**	**218721**	**968597**	**1585996**	**926531**

Table No – 19

Details of production of limestone and magnesian limestone during the plan period :

S.No	Year	Section along	Production	Production Quantity from mnes (T)	Section along	Development	Waste Quantity (T)	Ore : O.B
1	1st Year (2013-14)	Section BB', CC' & DD',	East 70 – 400 / North 135 – 345	445870	Section AA', BB' & CC',	East 00 – 290 / North 415 - 575	319527	1 : 0.72
2	2nd Year (2014-15)	Section AA', BB', CC' & DD',	East 30 – 320 / North 130 – 355	454470	Section AA' BB', CC', DD' & EE'	East 00 – 290 / North 415 - 575 East : 300 – 560 / North : 175 – 220 East : 70 – 230 / North : 70 – 230	285106	1 : 0.63
3	3rd Year (2015-16)	Section AA', BB', CC' & DD',	East 15 – 400 / North 120 – 345	452538	Section AA' BB', CC', DD' EE' & FF'	East 00 – 290 /North 415 – 575 East 400 – 500 /North 150 - 220	270247	1 : 0.60
4	4th Year (2016-17)	Section AA', BB', CC' DD'& EE'	East 50 – 460 / North 50 – 400	451000	Section AA' BB', CC', DD' & EE'	East 00 – 290 /North 415 – 575 East 260 – 505 /North 105 – 295	348522	1 : 0.77
5	5th Year (2017-18)	Section CC', DD' & EE'	East 175 – 500/ North 130 – 330	455297	Section AA' BB', CC', DD' EE' & FF	East 00 – 290 /North 415 – 575 East 365 – 550 /North 110 – 230	362594	1 : 0.80
				2259175			1585996	1 : 0.70

2.4. Mineral Beneficiation:

The ROM is transported from mines to crusher situated at the factory site, where separate feeding and crushing arrangements are available. Thus, no beneficiation of the limestone is involved except sizing of the quality material to meet the parameters specified for Cement manufacture. No chemical beneficiation is proposed /envisaged for the limestone. However Screening of Sub grade dump will be carried to recover limestone/Magnesian limestone

3.0 Review of Implementation of Mining Plan/ Scheme of Mining including Five Year

3.1 Salient points:

The mining plan under discussion is being submitted under Rule 24 of MCR-1960 since the lessee has applied for renewal of the lease. Salient proposals of the mine plan are given below.

Reclamation: The mine will be refilled along AA' to DD' between N 75 to N 490 and E 15 to E 435 upto 10 RL. Refilling of mine exhausted area will commence from II Scheme period

i.e from 2023-28 onwards. During the current plan period also part of the area is shown temporary refilling due to shortage of waste dump area. After exhaustion of the pit upto -40 RL along Section AA', BB' and CC' the temporary waste dump storage shown along Section EE' and FF' on mineralized area will be rehandled and mining will continue upto 10 RL.

Water ponds/ reservoir: No proposal of creating a water pond as mining will continue in the subsequent plan periods also.

Afforestation: As per the afforestation programme given in the mine scheme period, it was proposed to cover an area of 1.953 ha. during the scheme period. During the previous scheme period afforestation was carried out by planting, Neem, Pongamia, Teak, Jatropha, Prosopis Juliflora saplings with 50 % survival rate.

During the mining of limestone no effluents will be generated which will pollute the water. However periodical water analysis will be done as a part of the corporate philosophy and statutory requirement.

Similarly periodical monitoring of ambient air, noise will be carried out and necessary steps will be taken to maintain the levels will the permissible limits which is discussed in detail in the Environmental Chapter of the mine plan.

3.1 Measures for dust suppression :

The level of concentration of PM_{10} & $PM_{2.5}$ is well within the permissible statutory limits. However the following control measures will be adopted to keep the dust levels well within permissible limits.

Dust particles which are normally generated during various mining operations in mines become air bore thus leading to increase in PM_{10} & $PM_{2.5}$ level within the mining areas. Another source of dust generation is the transport of mineral and waste rock by dumpers, trucks etc. Adequate control measures will be taken during mining operations including transportation of mineral and waste rock. These control measures are as under

3.1.1 Control Measures during Mining Operations:

Dust extraction system is used in wagon drill machines. The cutting are wetted by adopting wet drilling wherever possible. Dust generation is being kept down to minimum by using sharpened bits for drilling holes with proper and efficient flushing system.

3.1.2 Control Measures during Transport of Mineral & Waste Rock :

Dust suppression system like water spraying on haul roads are practiced. Crowding of trucks on the haul road is avoided by properly spacing them to avert the concentration of dust emission at any time.

3.1.3 Mitigating Measures for Air Borne Dust :

In addition to the control measures already taken as above for minimizing the generation of dust during mining and transport operations, following steps are also taken to mitigate air borne dust within the mining blocks. Dense trees are planted around the mine wherever possible. Dust masks are provided to the workers engaged in drilling.

3.1.4 Measures to Control Noise Pollution :

The ambient noise levels in most of the cases are well within safe limit of 90 dB (A) prescribed by DGMS for eight hour exposure. However, the following control measures are taken covering the periphery of the mining area and the working area. Development of thick canopy of trees will be carried out as a part of afforestation which act as noise attenuators. Proper maintenance of the noise generating parts of the machines are introduced air silencers of suitable type which can modulate the noise of the engines of machinery are in use. They will be maintained effectively. Ear muffs will be given to those persons operating or working close to any machine generating more than 90 dB (A) levels on continuous basis.

3.1.5 Measures To Minimize Ground Vibrations Due To Blasting And Check Noise Pollution :

The ground vibration due to blasting was studied by D.G.M.S. at different locations and it was well within the limit. Besides the lessee has also carried out blasting vibration studies.

Review of compliance of Progressive Mine Closure Plan in the during the previous scheme period is given below in **Table No - 42**

Table No - 42

Information on Targets Made of Protective Measures Undertaken for Environmental Protection carried out during 2008-09				
Item	**Details**	**Quantity**	**Expenditure done Rs. in Lakhs**	**Remarks**
A) Reclamation & Rehabilitation of Mined out Area	Back filling	Nil	Nil	Back filling is yet to commence as the entire mining area is active and mineral is still to be exhausted
B) Stabilization of dumps with lease	1) Terracing	Nil		
	2) Construction of parapet walls / Retaining wall at terrace (mtr)	200	0.40	
	3) De-silting of settling pits & Channels	Nil	Nil	
	4) Coir Geo-textile (Sq.m.)	Nil	Nil	
C) Rehabilitation of barrier area within lease	1) Afforestation (Green Land Building) i.e. gap filling in safety zone area	350	0.25	
D) Environmental Monitoring (Core Zone and Buffer Zone Separately)	1) Ambient Air Quality (Core Zone)	Nil	Nil	
	1) Ambient Air Quality (Buffer Zone)	Nil		-
	2) Water Quality (Core Zone)	Nil	Nil	-
	2) Water Quality (Buffer Zone)	Nil		-
	3) Noise Level Survey (Core Zone)	Nil	Nil	___
	3) Noise Level Survey (Buffer Zone)	Nil		___
	4) Ground Vibration (Core Zone)	Nil	Nil	___
	5) Waste water quality	Quarterly	Nil	__
	TOTAL		0.65	

Information on Targets Made of Protective Measures Undertaken for Environmental Protection carried out during 2009-10				
Item	**Details**	**Quantity**	**Expenditure done Rs. in Lakhs**	**Remarks**
A) Reclamation & Rehabilitation of Mined out Area	Back filling	Nil	Nil	Back filling is yet to commence as the entire mining area is active and mineral is still to be exhausted
B) Stabilization of dumps with lease	1) Terracing	Nil		
	2) Construction of parapet walls / Retaining wall at terrace (mtr)	0.150	0.30	
	3) De-silting of settling pits & Channels	Nil	Nil	
	4) Coir Geo-textile (Sq.m.)	Nil	Nil	
C) Rehabilitation of barrier area within lease	1) Afforestation (Green Land Building) i.e. gap filling in safety zone area	750	0.50	
D) Environmental Monitoring (Core Zone and Buffer Zone Separately)	1) Ambient Air Quality (Core Zone)	Nil	Nil	Nil
	1) Ambient Air Quality (Buffer Zone)	Nil		Nil
	2) Water Quality (Core Zone)	Nil	Nil	Nil
	2) Water Quality (Buffer Zone)	Nil		Nil
	3) Noise Level Survey (Core Zone)	Nil	Nil	Nil
	3) Noise Level Survey (Buffer Zone)	Nil		Nil
	4) Ground Vibration (Core Zone)	Nil	Nil	Nil
	5) Waste water quality	Nil	Nil	Nil
	TOTAL		0.80	

Information on Targets Made of Protective Measures Undertaken for Environmental Protection carried out during 2010-11				
Item	**Details**	**Quantity**	**Expenditure done Rs. in Lakhs**	**Remarks**
A) Reclamation & Rehabilitation of Mined out Area	Back filling	Nil	Nil	Back filling is yet to commence as the entire mining area is active and mineral is still to be exhausted
B) Stabilization of dumps with lease	1) Terracing	Nil		
	2) Construction of parapet walls / Retaining wall at terrace (mtr)	225	0.45	
	3) De-silting of settling pits & Channels	Nil	Nil	
	4) Coir Geo-textile (Sq.m.)	Nil	Nil	
C) Rehabilitation of barrier area within lease	1) Afforestation (Green Land Building) i.e. gap filling in safety zone area	650	0.45	
D) Environmental Monitoring (Core Zone and Buffer Zone Separately)	1) Ambient Air Quality (Core Zone)	Nil	Nil	Nil
	1) Ambient Air Quality (Buffer Zone)	Nil		Nil
	2) Water Quality (Core Zone)	Nil	Nil	Nil
	2) Water Quality (Buffer Zone)	Nil		Nil
	3) Noise Level Survey (Core Zone)	Nil	Nil	Nil
	3) Noise Level Survey (Buffer Zone)	Nil		Nil
	4) Ground Vibration (Core Zone)	Nil	Nil	Nil
	5) Waste water quality	Nil	Nil	Nil
	TOTAL		0.90	

Information on Targets Made of Protective Measures Undertaken for Environmental Protection carried out during 2011-12				
Item	**Details**	**Quantity**	**Expenditure done Rs. in Lakhs**	**Remarks**
A) Reclamation & Rehabilitation of Mined out Area	Back filling	Nil	Nil	Back filling is yet to commence as the entire mining area is active and mineral is still to be exhausted
B) Stabilization of dumps with lease	1) Terracing	Nil		
	2) Construction of parapet walls / Retaining wall at terrace (mtr)	225	0.45	
	3) De-silting of settling pits & Channels	Nil	Nil	
	4) Coir Geo-textile (Sq.m.)	Nil	Nil	
C) Rehabilitation of barrier area within lease	1) Afforestation (Green Land Building) i.e. gap filling in safety zone area	1000	0.75	
D) Environmental Monitoring (Core Zone and Buffer Zone Separately)	1) Ambient Air Quality (Core Zone)	1 stations	1.25	6 Stations, half yearly 6 samples
	1) Ambient Air Quality (Buffer Zone)	5 stations		
	2) Water Quality (Core Zone)	2	1.25	7 Stations , half yearly 7 samples
	2) Water Quality (Buffer Zone)	5		
	3) Noise Level Survey (Core Zone)	2	0.50	7 Stations , half yearly 7 samples
	3) Noise Level Survey (Buffer Zone)	5		
	4) Ground Vibration (Core Zone)	1 time	1.00	___
	5) Waste water quality	Quarterly	0.20	__
	TOTAL		5.40	

Information on Targets Made of Protective Measures Undertaken for Environmental Protection carried out during 2012-13				
Item	**Details**	**Quantity**	**Expenditure done Rs. in Lakhs**	**Remarks**
A) Reclamation & Rehabilitation of Mined out Area	Back filling	Nil	Nil	Back filling is yet to commence as the entire mining area is active and mineral is still to be exhausted
B) Stabilization of dumps with lease	1) Terracing	Nil		
	2) Construction of parapet walls / Retaining wall at terrace (mtr)	Nil	Nil	
	3) De-silting of settling pits & Channels	Nil	Nil	
	4) Coir Geo-textile (Sq.m.)	Nil	Nil	
C) Rehabilitation of barrier area within lease	1) Afforestation (Green Land Building) i.e. gap filling in safety zone area	500	0.35	
D) Environmental Monitoring (Core Zone and Buffer Zone Separately)	1) Ambient Air Quality (Core Zone)	1 stations	1.25	6 Stations, half yearly 6 samples
	1) Ambient Air Quality (Buffer Zone)	5 stations		6 Stations, quarterly 6 samples
	2) Water Quality (Core Zone)	2	1.25	7 Stations , half yearly 7 samples
	2) Water Quality (Buffer Zone)	5		7 Stations , 4 season
	3) Noise Level Survey (Core Zone)	2	0.50	7 Stations , half yearly 7 samples
	3) Noise Level Survey (Buffer Zone)	5		___
	4) Ground Vibration (Core Zone)	1 time	1.00	___
	5) Waste water quality	Quarterly	0.20	__
	TOTAL		4.55	

4.0 **Closure Plan :**

4.1. Mined – Out Land:

The limestone occurring in the Mining lease Area is a linear body narrow in the eastern side and gets wider on the western side. The width of the limestone band is about 285 m in the Western Part and about 180 m in the Eastern Part. General strike of the band is East – West directions and dip towards south. Pits are opened along the strike direction and more or less benches are formed parallel to the strike direction. Depth of the lime stone has been proved generally up to – 40 RL and benches will be formed up to that level. 10.19 Mil.T of mineable reserves is available at the start of the plan period, mining will take place for 22.6 years at the proposed rate of production excluding the present plan period. Temporary refilling will be carried out during the present plan period. However refilling will take place from 2023 onwards. Refer **Plate – 11** for Progressive Mine Closure Plan.

4.1.1. Ultimate Extent and size of the Pit:

Average length (m)	**Average width(m)**	**Average depth (m)**
630	550	- 40 RL or 120 m(Maximum) Average depth 74 m

The ultimate pit boundary of the area is shown in the Conceptual Mining Plan and in Conceptual Mining Cross Section.

Proposal of reclamation:- only temporary stacking of waste will take place inside the pit during the 4th and 5th year of the plan period. The mine will not be refilled during the present plan period. However refilling of the worked out pit will commence from 2023 onwards i.e. from second scheme period. Besides the dumps will be re-handled and refilled in the mineral exhausted pits. Thus the dumps are temporary and ultimately no dumps will exist in the post mining period.

4.2 Water Quality Management :

The ground water available within the Core Zone area is being pumped out for domestic purpose. Besides, the water collected in the mine sump will be allowed to settle down and then pumped for afforestation, dust suppression besides using the water for farm lands of the applicant situated at distance of 3 kms from the mining area. The surface water sources are River Thamiraparani and Tirunelveli canal which is at distance of 8 & 7.5 kms respectively from the Core Zone Area.

Surface water and Ground water samples were collected in different locations. The results of the water analysis are given in the below table.

Seven sampling stations have been fixed to represent both ground and Surface water within the buffer zone. The results are tabulated vide **Annexure –14.** From the analysis results it could be seen that all the vital parameters are within permissible limits of safe drinking water and hence the water is Potable

4.2.1. Physiographical Details and Drainage Pattern:

The limestone deposit in the Mining lease area is situated on the southern slope of the Thalaiyuthu quartzite hillock which is running East West direction. The terrain area has a low relief on the southern side. The area is rocky with quartzite boulders occurring all around and scattered. The area experiences very scanty rainfall even during monsoon period. The vegetation are mainly xerophytes like cactus, and no other trees are found to be grown in the area. The perennial River Thamirabarani is flowing 8 km South East of the lease area. There are some small water bodies occurring here and there around the area. They are seasonal and dry almost throughout the year.

4.2.2. Hydro – Geological Conditions:

The region is predominantly rocky with scanty vegetation and soil cover. The climate is arid with little rainfall. These factors coupled with absence of good aquifers are not conducive to rich ground water resources.

The groundwater level in dug wells during July-2011 is generally in the range of 2.12 m bgl to 10.20 m bgl. whereas, in bore wells the depth to water is in the range of 6.90 m bgl to 10.04 m bgl. The same wells were monitored during Feb-12 and water samples also collected for analysis. The groundwater level in dug wells during Feb-2012 is generally in the range of 0.80 m bgl to7.20 m bgl. Whereas the depth to water level in bore wells during feb-12 is measured and it is in the range of 4.23m bgl to 7.04 m bgl.

From the Reconnaissance field survey and water level monitoring, it is inferred that, the shallow aquifers system is not getting affected due by the mining activity. It is proved with the existing conditions that the water levels measured are ranging from 3 to 12 m bgl in and around/nearby the mining area, whereas the mining operation is going upto 90-100 m below ground level. Thereby, the natural recharge mechanism i.e recharge to groundwater regime of shallow aquifers is not affected by the existing mining activities. Also, the deeper aquifers are not present in the mining area.

Hence, it is inferred that even though the existing depth of the mine is more than 90 m below ground level, the groundwater recharge is taking place in the shallow aquifers (up to 20m) is not getting drained out into mine. The presence of shallow water level is an indication that ground water recharge is not affected due to the mining activity indicating heterogeneity nature of the aquifers present in the area.

4.2.3. Measures for minimizing Adverse Effects on Water Regime:

The source of water pollution will be from the soil wash off emanating from excavated quarry benches and mine areas, from external dumps and pumping of water from the mine sump. To minimize the adverse effects on water regime due to the above activities, the following control measure will be taken.

iv) Maintain gradient of 1 or 20 for drainage of water on the bench floors and construction of water drains using local material to prevent wash off and un-controlled descent of water.

v) Garland drains will be dug around the quarry to prevent rain water draining in to the quarry.

vi) The dumps will be provided with inner slope on top surface and through a system of drains will be allowed to descend in to surrounding drains so as to minimize the erosional effects arising out of uncontrolled descent of water.

vii) Mine sump water will be pumped by suitable pumps mounted at the top of mine sump, 4" delivery G.I. pipes are used to deliver the water up to the plantation point for afforestation work. Hence there will not be any water let outside the premises and the entire pumped water will be used for plantation.

4.3 Air Quality Management :

4.3.1. Quality of Air:

In any mechanized mining operations , using the down the hole drilling , heavy earth moving machineries like excavators & tippers , some quantity of dust is bound to be generated depending on the topography , nature of the material handled and climatology parameters like wind speed , wind direction and stability classification of the area viz. location of the buffer zone villages. The deleterious parameters of the air quality to be considered for open cast mine shall be So2, & NOx. From the base line data generated so far, it is found that the ambient air quality is within the permissive limits of CPCB.

Air:

- To establish the ambient air quality, air quality was studied during different periods.
- Ambient air quality sampling was carried out, with the help of high volume air samplers and repairable dust samplers.

- Air monitoring stations have been fixed covering the 6 locations.
- The 6 stations are fixed at Front side of Mines Office, Near Generator Room, Top of quarry, Near Haul roads, near north loading point and near drilling area in the mines. The parameters of PM10 & pm 2.5, NOX and SO2 are monitored. The CO is below detectable limits.
- The ambient air, the PM10 values were in the range of 38.1-92.4 ug/m^3. PM2.5 values were in the range of 18.5 to 49.9 ug/m^3. SO_2 levels were ranging from 4.2 to7.4 ug/m^3. NOx levels were ranging from 8 to 23.7ug/m^3. While comparing with the NAAQ Norms, all monitored PM_{10}, $PM_{2.5}$, SO2, NOx, and values were found to be well within the respective limit values.The CO values in the all locations found to be below detectable limit.
- The existing Ambient Air Quality levels for PM 10, PM 2.5, SO_2 & NOX are within the prescribed CPCB limits for “Industrial, Residential, Rural & other areas”.
- Results are tabulated and given vide **Annexure No – 12.** It is thus found all the relevant air quality parameters are found to be well within the threshold levels.

4.3.2. Corrective Measures Taken for Prevention of Air Pollution:

The level of concentration of PM_{10} & $PM_{2.5}$ is well within the permissible statutory limits. They are below the limits prescribed by the CPCB in case of all pollutants. Following control measures are however adopted to keep the dust levels well within permissible limits**.**

Dust particles which are normally generated during various mining operations in mines become air borne thus leading to increase in particulate matter level within the mining areas. Another source of dust generation is the transport of mineral and waste rock by dumpers/dump trucks, etc. Adequate control measures are therefore taken during mining operations including transportation of minerals and waste rock. These control measure s are as under.

a) Control Measures during Mining Operations

i) Dust extraction system will be used in drill machines. The cuttings will be wetted by wet drilling wherever possible.

ii) Dust generation will also be kept down to minimum by using sharpened bits for drilling holes with proper and efficient flushing system.

b) Control Measures during Transport of Mineral & Waste Rock

i) Dust suppression system like water spraying on haul roads will be regularly practiced. This shall be followed vigorously. In addition, whirling type of sprinklers will also be introduced on a straight portion of haul road.

ii) Crowding of dumpers on the haul road will avoided by properly spacing them to avert the concentration of dust emission at any time.

C) Mitigating Measures For Air Borne Dust:

In addition to the control measures already taken as above for minimizing the generation of dust during mining and transport operations, following steps are also be intensified to mitigate air borne dust within the mining blocks.

i) Dense tree belts shall be planted around the mine wherever possible.

ii) Plantation shall be done on dumps to stabilize the same.

iii) Dust masks shall be provided to the workers engaged in drilling.

4.4 Waste Management:

4.4.1. Rate of yearly generation of wastes and proposals for disposal of waste:

The only waste mined from this mine is development and interstitial waste. The generation of development waste from the area is given below in Table

Year Wise Generation of Development Waste Quantity

Table No - 28

Year	Mineral Reject	Sibeburden	Interburden	Total waste
	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)
2013-14	78682	0	240845	319527
2014-15	80201	93199	111706	285106
2015-16	79860	11513	178874	270247
2016-17	79588	44235	224699	348522
2017-18	80347	69774	212473	362594
TOTAL	398678	218721	968597	1585996

4.4.2. Land Chosen for disposal of waste with proposed justification

Sufficient care was taken while selecting the site for waste dump based on the economically feasibility and ultimate depth of mining.

During the plan period waste will be dumped on the North western corner of the lease. This area will not affect future mining.

During the plan period an area of about 3.114 Ha will be utilized for dumping the waste. Further 2.425 Ha will be utilized for sub grade dumping.

During the conceptual period temporary dump will be created within the eastern side of the pit. The temporary dump will be rehandled and dumped in the western side of the lease area once the mineral is exhausted in this portion. This will be done during the second scheme period i.e from 2023 onwards. No additional area is required for dumping. Hence the area selected for dumping is adequate.

4.4.3. Stabilization and vegetation of dumps:

The overburden is dumped, in the plan period, in the area allotted for the dump yard. The dump will have a height of 30 m and shall be sloped in 1 in 2. Below the foot of the slopes a retaining wall of 1.2 m x 1.2 m shall be constructed using waste boulders with a view to contain the loose soil dump. The waste dumps will be re-handled during the conceptual period and refilled in the worked out pits.

Although the dumps are temporary the dump shall be suitably stabilized using hamata grass species and legumes to prevent soil erosion. The slopes shall have contour trenches of 1 m interval where agaves species shall be planted to consolidate the dump.

Preventive measures:

i) The dump tops will be adequately sloped and water diversion channel shall be provided to prevent erosion & formation of gullies.
ii) Earthen banks will be provided around the dumps to arrest silt.
iii) Proper terracing of dump slopes with optimum height will be made.
iv) Mixed grass application on dumps slopes.
v) To prevent siltation around the dump, garland drains will be constructed.
vi) There are no toxic and hazardous elements present in the waste material.

The dumps are going to active dumps and the dumping will be carried out during the plan period. Hence the proposal of dump plantation does not arise during the present plan period.

4.5 Topsoil Management :

Since the mine is one of the oldest mine and already opened and limestone exposed, there will not be any generation of topsoil further more.

4.6 Tailing Dam Management :

During mining operation for exploitation of limestone, no other beneficiation process are involved. Hence the management of tailing dam is not applicable.

4.7. Infrastructure:

Infrastructure facilities in the form of office, store room, first aid room, drinking water bore well are already provided in the mine. The buildings are semi-permanent in nature and there will not be any problem in dismantling them during the closure of mine. The bore wells will be utilized for public purpose after the closure of the mine. The mine roads are also semi-permanent in nature and there will not be any impact after the closure of mine.

4.8. Disposal of Mining Machinery:

There is no proposal of decommissioning of mining machineries as they will be shifted to other mines of the applicant.

4.9. Safety and Security:

As a measure of safety, peripheral bund all along mining lease area will be formed. To avoid unauthorized entry to the excavated areas from the surface openings by general public, proper fencing will be made and also plantation will be raised all along the periphery of the worked out pit .

4.10 Disaster Management and Risk Management:

Risk assessment is a process whereby risks are analysed, assessed and risk management priorities are evaluated. It is defined as the characterization of the potential adverse effect to human health & environment due to environmental hazards.

Objectives of risk assessment:-

- Identifying hazardous activities
- Assessment of risk level and severity in different operations
- Identification of control measures
- Setting monitoring process
- Reduce the impact of mishaps of all kinds
- Reduce the inherent potential for major accidents

Methodology of Risk assessment:-

- Collection of information & identification of hazard
- Classify their severity and probability of occurrence
- Identification of exposed risks
- Assess the risk and risk rating based on
  - Probability
  - Exposure
  - Consequence

- Prioritization of the risks
- Implementation of control measures
- Monitoring risk assessment
- Evaluation and correction

Risk assessment is mainly based on the environmental impact of various parameters.

i) Land contamination:-

The potential for contamination during operation of mine site is, waste rock dump which regard as contaminated land.

ii) Aquatic toxicity:-

The risk assessment in aquatic toxicity system is based on the total metal concentration in various chemical form or oxidation state. Limestone does not contain appreciable concentration of toxic elements.

iii) Acid mine drainage:-

The mining of limestone does not involve any processing operation or by using chemicals. Hence there is no risk at mine site with regard to control of acid mine drainage

iv) Tailing dam:-

Tailings are very fine residuals in the chemical processing operation. It is a potential source of environment contamination. In the limestone mining operation there is no possibility of tailing materials since it is not involved in the chemical process.

v) Human health:-

The chemicals from tailing dam and waste heaps may severely affect the human health. The sulphur contained in the dump can make the land toxic which indirectly affect the human health. During Environment Impact Assessment toxicity was nil. Hence there is no risk involved to human health due to limestone mining operation. Nnnn

Factors of risks involved due to human induced activities in connection with mining operations are 1) removal of O.B and side burden 2) drilling 3) blasting 4) excavation of ore and 5) transportation of ore.

Other factors due to natural activities are 1) fire 2) water inundation 3) electricity and 4) natural calamities.

S.No	Factors	Causes of risks	Control measures
1	Removal of O.B	a) Top soil & O.B bench may slide due to its unconsolidated nature. b) Vibration due to movement of vehicles in the O.B benches	Over all O.B bench slope angle will be maintained not more than 45° Bench height shall not exceed 1.5 m in O.B
2	Drilling	a)Due to high pressure of compressed air hoses may burst b)Jack hammer rod may broken due to improper maintenance of the rod	During preventive & Periodical maintenance and replacement of worn out accessories in the compressor and drill equipment As per manufacturers recommendation rod to be replaced and bits will be changed
3	Blasting	a) Fly rock, ground vibration and noise etc., b) Improper charging of explosives	Burden and spacing will be kept optimum on trail basis and inclined drilling will be done. Explosive charge per delay will be minimized.
4	Excavation of Ore	a)Hauling and loading equipment are in such proximity while excavation b)Swinging of bucket over the body of tipper c) Driving of un authorized person	Operator shall not operate the machine when person & vehicles are in such proximity Shall not swing the bucket over the cab and operator leaves the machine after ensuring the bucket is on ground Shall not allow any unauthorized person to operate the machine by effective supervision
5	Transportation of ore	a)Operating the vehicle " nose to tail" b) Overloading of material c) While reversal & overtaking of vehicle d) Operator of truck leaving his cabin when it is loaded.	It will be ensured that all these causes will be nullified by giving training to the operators No over loading Audio visual reverse horn will be provided Proper training will be given
6	Fire due to electricity and Oil	a)Due to the short circuit of cables & other electrical parts	Commutator & electrical parts shall be cleaned frequently with

		b) Due to the leakage of inflammable liquid like diesel, oil etc,	the help of dry air blower All fastening parts and places will be tightened.
7	Water inundation	a)Inrush of storm water due to heavy rain b) Unprecedented opening of dam in the upstream side of the river c) Unusual seepage of water from river side d)Sudden collapse of peripheral bund due to torrential pour	Guard will keep a continuous watch on water level and when touches danger mark immediately inform to the mine official. On getting the flood , warning siren will be given Withdraw all the persons from the mine via shortest route in an orderly manner Work shall not be resumed except with the prior permission of the Manager unless all the working places thoroughly examined by a competent person.
8	Natural calamities	Unexpected happenings	The mine management is capable to deal with the situation

Disaster Management Plan:-

The management is able to deal with the situation efficiently to reduce confusion keeping in view of the likely sources of danger in the mine.

Structure of the Disaster Management Plan:-

Out line of Disaster management plan:-

The purpose of disaster management plan is to restore the normalcy for early resumption of mining operation due to an unexpected, sudden occurrence resulting to an abnormality in the course of mining activity leading to a serious danger to workers or any machinery or the environment

System of communication:-

Krisna mines has an internal communication system provoided for the department head and to their line of command with telephone. And also it has the telephone nos and addresses of adjoining mines, rescue station, police station, Fire service staw tion, local hospital, electricity supply agency and standing consultative committee members.

Consultative committee:-

A standing consultative committee isformed under the head of Mines manager. The members consists of safety officer / medical officer / Asst. manager/ public relation officer/ Foreman/ and environmental engineer.

Facilities & Accommodation:-

Accommodation and facilities for medical centre, rescue room and for various working groups will be provided.

First Aid & medical facilities:-

The mine management is having first aid / medical centre for use in emergency situation. All casualties would be registered and will be given first aid. The centre will have facilities for first aid & minor treatment, resuscitation, ambulance and transport. It will have proper telephone / wireless set for quick communication with hospitals where the complicated cases are to be sent.

Stores and equipment:-

A detailed list of equipment is available, its type & capacity and items reserved for emergency.

Transport services:-

A well defined transport and control system will be provided to deal with the situation.

Functions of public relations group:-

To make a cordial relation with government officials and other social service organization and working groups. To liaise with representatives of the mine to ameliorate the situation of panic, tension, sentiments, grievances and misgivings created by any disaster. To ameliorate the injured, survivors and family members of affected persons by providing material, moral support and establishing contact with relatives of victims.

Security: - Manning of security posts

Catering & Refreshment: - Arrangement to be made for the victims, rescue teams and others.

4.11 Care and maintenance during temporary discontinuance:

If the mine will be discontinued temporarily for more than 120 days, notice will be given 30 days before the date of such discontinuance to the concerned authorities. During discontinuance period safety arrangement and fencing will be provided to avoid the entry of unauthorized persons. The accessibility to the mine from the surface will be prevented by providing fencing arrangement.

Emergency plan:-

On realising anything serious happening anywhere in the mine, action will be taken to immediately inform the nearest mining official will be taken.

On being informed about the emergency it will be verified for the correctness of information and telephone in particular to the Manager and managers of adjoining mine so that persons may be withdrawn.

On receiving information of emergency, intimation will be sent to the consultative committee which is already formed. Shift in-charge will ensure that all the materials and transport system to deal with emergency situation is well prepared and in readiness.

First aid facilities to be ready to receive the cases.

Name, address and contact number of the person responsible for management of the disaster / emergency plan is given below

Mines Manager,
23, Sripuram,
Tirunelveli District.
Tamil Nadu,
Ph: (0462) 2333200

5.0 Economic Repercussions of Closure of Mine and Manpower Retrenchments:

5.1 Number of local residents employed in the mine, status of the continuation of family occupation and scope of joining the occupation back:

The lessee employees around 67 persons (Skilled, Semi-skilled and Unskilled) for mining and connected activities from the nearby villages. The mining will continue throughout the year giving enough for the people employed.

5.2 Compensation given or to be given to the employees connecting with sustenance of workmen and their family members:

The lessee will adhere by the law prevailing at the time of discontinuance, if such a need arise.

5.3 Satellite occupations connected to the mining industry – number of persons engaged therein continuance of such business after the mines close: Not Applicable.

5.4 Continued engagement of employees in the rehabilitation status of mining lease area and any other remnants activities: Not applicable

5.5 Envisaged repercussions on the expectation of the society around due to closure of the mine: In case of closure of the mining activity of this particular mine the labour force will be shifted to other mines of the applicant the vicinity catering the needs of the plant

6.0 Time Scheduling for Abandonment:

The proposed rate of production per annum is roughly 450000 Ts or 0.45MTPA. The mineable reserves calculated as 10.19 Mil.T inclusive of magnesium limestone. The proposed rate of production will also be maintained during the conceptual period. Based on the rate of production per day, the life of the mine will be 22.6 years or 23 years After exhaustion of all mineral, part of the pit will be refilled and part of the pit will be used for storing rain water and the mine will be protected by providing barbed wire fencing. The dumps will be re-handled and refilled in the worked out pits.

However the time schedule for abandonment of the mine is discussed below in brief.

1. Construction of retention wall - 1200 m
   Size: Width – bottom 3 m, Top – 2.0 m and Height – 3.0 m
   Volume of work – 1200 *(3+2)/2 * 3.0 = 9000 Cu.m
2. Fencing at top of workings:
   Total length of fencing – 1500 m
   No: of workers required for fencing including fixing of granite poles @ 3 / m interval and 4 rows of barbed wire
   @ 20 m/worker/day - 75 man days
   @ 5 workers/day - 15 days

7.0 Abandonment Cost:

The abandonment cost includes cost of fencing, cost of stabilization of dumps and plantation cost etc., The G.O.M.S. No.48/115 and G.O.M.S. No. 1081 are being worked continuously and they are adjacent to each other. As far as G.O. No. 1081 is concerned only two sides are free for fencing (i.e., Northern, southern and part of eastern side), the western side of the lease is covered by pits of India Cements Mines. Hence the abandonment cost is calculated only for the three sides. The required length of the barbed wire for fencing is roughly 1500 m.

Tentative cost of each of important activity of abandonment e.g, decommissioning, reclamation & rehabilitation etc have been indicated to have an idea about the funds that

may be required for the final closure is indicated below. This included the amount proposed to be spent for reclamation & rehabilitation during the PMCP period i.e. the present plan period.

1) Decommissioning / Demolition :

Not applicable

2) Removal of infrastructure

Permanent structures are proposed for office infrastructures, first aid centre etc which will be utilized by public after the mining operation ceases.

3) Removal of equipments and heavy machineries:

The HEMM deployed will be shifted to other mines or sold.

4) Site Safety:

Fencing

Fencing at top of workings:

Total length of fencing	-	1500 m

No: of workers required for fencing including fixing of granite poles @ 3m interval and 3 rows of barbed wire

@ 20 m/worker/day	-	75 man days
@ 5 workers/day	-	15 days
Cost of granite poles	-	500*150=Rs.75, 000
Cost of 1 kg barbed wire (6m per Kg)	-	Rs.100
Cost of barbed wire	-	750*100= 75,000
Cost of labourers	-	15*5*150= Rs.11, 250
Total cost for Fencing	-	Rs 1, 61,250

5) Remediation / Mitigation measures:

Total cost required for constructing garland drain, retaining wall and reclamation and rehabilitation of dumps through plantation are calculated as follows:

i) Providing garland drain:

Taking an average length of 1000m, total amount required will be Rs.4, 00,000/- @Rs.200/- per meter. Dimension of the garland drain will be of 1000 m (length) x 2m (width) x 1m (depth).

ii). Retaining Wall

Retaining wall for a length of 1000 m having a width of 1m and height of 2 m is planned all along the foot of the dumps & also at terraces. The total cost for constructing retaining wall is Rs.2, 00,000 @ Rs.100/cu.m

iii). Monitoring

Cost of Environmental monitoring per annum = Rs 2, 50,000 lakhs (AAQ+Noise+water)

iv) Total expenses shall be Rs.10, 11,000/-

viii) Standard cost norm for enrichment of plantation per Ha is as under

a) PRE-PLANTING & NURSERY

Table No - 43

Sl. No.	**2500 plants/Ha**	**Wage rate Rs.150/-**	
	Item of work	**Man days Required**	**Amount (in Rs.)**
1	Site preparation	15	22,50.00
2	Alignment & stacking	10	1500.00
3	Nursery cost of 2500 seedlings @Rs.5.00	-----	12500.00
4	Pitting	15	2250.00
Sub Total :			**18500.00**

b) CREATION AND MAINTENANCE **Table No - 44**

1.	Carriage & planting	10	750.00
2.	Weeding, soil working and manuring (thrice)	7	1050.00
3.	Application insecticides (thrice)	3	450.00
4.	Fireline tracing inspection path	4	600.00
5.	Cost of fertilizer & insecticides	Lump sum	2000.00
6.	Watch & ward	2	300.00
Sub-Total :			**5150.00**
	Grand total ;		**23,650**

(6). Reclamation and rehabilitation of workings: -

(7) Maintenance / monitoring during and after closure operation:

Not applicable

(8) Retrenchment and relocation cost:

Not applicable

(9) Research and development:

Not applicable

(10) Administrative/management:

i) Fees to be paid for preparation of closure plan procurement of information and data from various institution/organization is Rs.1, 00,000/-.

ii) Salary and wages of at least Two (2) supervisory and managerial personnel for maintenance and monitoring activities for 2 years Rs.1,44,000/- @ Rs.6,000/- per month per person in an average.

iii) Total amount requirement under administrative expenditures is Rs.1,00,000/- + Rs.1,44,000/- = Rs.2,44,000/-

Table No - 45

YEARLY PROPOSAL FOR ITEM NO. 6 & 7 OF PMCP FOR 2013-14(1st YEAR) FOR KRISHNA MINES IN RAMAYANPATTI OVER AN EXTENT 31.092 HA.				
Items	**Details**	**Area (Ha.) Prop**	**Area In Actual In Ha**	**Expenditure(Rs In Lakhs)**
	I YEAR			
(A) RECLAMATION & REHABILITATION OF MINED OUT : LAND/AREA	(i) Backfilling	Nil	Nil	Nil
	(ii) Afforestation on the backfilled area	Nil	Nil	Nil
	(iii) Others (please specify) e.g. Afforestation on exhausted benches.	Nil	Nil	Nil
	(iv) Pisciculture			
	(v) Converting into water reservoir	Nil	Nil	Nil
	(vi) Picnic Spot	Nil	Nil	Nil
(B) STABILIZATION & REHABILISATION OF DUMPS (within mining lease)	(i) Terracing			
	(ii) Pitching			
	(iii) Construction of Parapet Walls/ Retaining wall at toe of dumps (in mtr)/SG stack		300 meters	@Rs.150/M (Stone Pitching) **Rs.45,000**
	(iv) Construction of Check Dams along slope of valise etc.		Nil	**Nil**
	(v) Construction of Settling Ponds (Garland drain etc.)		Settling pond – 1 no. Garland drain	Settling Pond – **Rs. 50,000/-** Garland drain – **Rs.60,000/-**
	(vi) De-silting of settling ponds, channels		Nil	**Nil**
	(vii) Afforestation on dumps		Nil	Nil
	(viii) Others (Please specify)		Nil	Nil
(C) REHABILITATION OF BARREND AREA WITHIN LEASE	(i) Afforestation (Green belt building)		800 no.	@Rs.10/- per tree including sapling, digging and planting – **Rs.8,000/-** Water per day 1 trips/Day for 250 days - **Rs. 27,000/-** Maintenance -**Rs. 28,500/-** **Total-Rs 63,000/-**
	(ii) Others (Please specify)			
(D) ENVIRONMENTAL MONITORING (Core zone & Buffer zone separately)	(i) Ambient Air Quality			**Quarterly monitoring – Rs.1,25,000/-**
	(ii) Water Quality (Surface and Ground water			**Quarterly monitoring Rs.1,25,000/-**
	(iii) Noise Level Survey			**Quarterly monitoring Rs.50,000/-**
	(iv) Ground Vibration			Once in a year **Rs.50,000/-**
	(v) Others (Please specify)			
Total				**Rs.5.68 lakhs**

YEARLY PROPOSAL FOR ITEM NO. 6 & 7 OF PMCP FOR 2014-15 (2nd YEAR) FOR KRISHNA MINES IN RAMAYANPATTI OVER AN EXTENT 31.092 HA.				
Items	**Details**	**Area (Ha.) Prop**	**Area In Actual In Ha**	**Expenditure(Rs In Lakhs)**
	I YEAR			
(A) RECLAMATION & REHABILITATION OF MINED OUT : LAND/AREA	(i) Backfilling	Nil	Nil	Nil
	(ii) Afforestation on the backfilled area	Nil	Nil	Nil
	(iii) Others (please specify) e.g. Afforestation on exhausted benches.	Nil	Nil	Nil
	(iv) Pisciculture			
	(v) Converting into water reservoir	Nil	Nil	Nil
	(vi) Picnic Spot	Nil	Nil	Nil
(B) STABILIZATION & REHABILISATION OF DUMPS (within mining lease)	(i) Terracing			
	(ii) Pitching			
	(iii) Construction of Parapet Walls/ Retaining wall at toe of dumps (in mtr)/SG stack		300 meters	@Rs.150/M (Stone Pitching) **Rs.45,000**
	(iv) Construction of Check Dams along slope of valise		Nil	**Nil**
	(v) Construction of Settling Ponds (Garland drain etc.)		Settling pond – 1 no. Garland drain -	Settling Pond – **Rs. 50,000/-** Garland drain – **Rs.60,000/-**
	(vi) De-silting of settling ponds, channels		Nil	**Nil**
	(vii) Afforestation on dumps		Nil	Nil
	(viii) Others (Please specify)		Nil	Nil
(C) REHABILITATION OF BARREND AREA WITHIN LEASE	(i) Afforestation (Green belt building)		825 no.	@Rs.10/- per tree including sapling, digging and planting – **Rs.8,250/-** Water per day 1 trips/Day for 250 days - **Rs. 27,000/-** Maintenance -**Rs. 28,500/-** **Total-Rs 63,750/-**
	(ii) Others (Please specify)			
(D) ENVIRONMENTAL MONITORING (Core zone & Buffer zone separately)	(i) Ambient Air Quality			**Quarterly monitoring – Rs.1,25,000/-**
	(ii) Water Quality (Surface and Ground water			**Quarterly monitoring Rs.1,25,000/-**
	(iii) Noise Level Survey			**Quarterly monitoring Rs.50,000/-**
	(iv) Ground Vibration			Once in a year **Rs.50,000/-**
	(v) Others (Please specify)			
Total				**Rs.5.687 lakhs**

YEARLY PROPOSAL FOR ITEM NO. 6 & 7 OF PMCP FOR 2015-16(3rd YEAR) FOR KRISHNA MINES IN RAMAYANPATTI OVER AN EXTENT 31.092 HA.				
Items	**Details**	**Area (Ha.) Prop**	**Area In Actual In Ha**	**Expenditure(Rs In Lakhs)**
	I YEAR			
(A) RECLAMATION & REHABILITATION OF MINED OUT : LAND/AREA	(i) Backfilling	Nil	Nil	Nil
	(ii) Afforestation on the backfilled area	Nil	Nil	Nil
	(iii) Others (please specify) e.g. Afforestation on exhausted benches.	Nil	Nil	Nil
	(iv) Pisciculture			
	(v) Converting into water reservoir	Nil	Nil	Nil
	(vi) Picnic Spot	Nil	Nil	Nil
(B) STABILIZATION & REHABILISATION OF DUMPS (within mining lease)	(i) Terracing			
	(ii) Pitching			
	(iii) Construction of Parapet Walls/ Retaining wall at toe of dumps (in mtr)/SG stack		300 meters	@Rs.150/M (Stone Pitching) **Rs.45,000**
	(iv) Construction of Check Dams along slope of valise		Nil	**Nil**
	(v) Construction of Settling Ponds (Garland drain etc.)		Garland drain - 300.00 m	Garland drain – **Rs.60,000/-**
	(vi) De-silting of settling ponds, channels		Nil	**Nil**
	(vii) Afforestation on dumps		Nil	Nil
	(viii) Others (Please specify)		Nil	Nil
(C) REHABILITATION OF BARREND AREA WITHIN LEASE	(i) Afforestation (Green belt building)		1000 no.	@Rs.10/- per tree including sapling, digging and planting **– Rs.10,000/-** Water per day 1 trips/Day for 250 days - **Rs. 27,000/-** Maintenance -**Rs. 28,500/-** **Total-Rs 65,500/-**
	(ii) Others (Please specify)			
(D) ENVIRONMENTAL MONITORING (Core zone & Buffer zone separately)	(i) Ambient Air Quality			**Quarterly monitoring – Rs.1,25,000/-**
	(ii) Water Quality (Surface and Ground water			**Quarterly monitoring Rs.1,25,000/-**
	(iii) Noise Level Survey			**Quarterly monitoring Rs.50,000/-**
	(iv) Ground Vibration			Once in a year **Rs.50,000/-**
	(v) Others (Please specify)			
Total				**Rs.5.205 lakhs**

YEARLY PROPOSAL FOR ITEM NO. 6 & 7 OF PMCP FOR 2016-17 (4th YEAR) FOR KRISHNA MINES IN RAMAYANPATTI OVER AN EXTENT 31.092 HA.				
Items	**Details**	**Area (Ha.) Prop**	**Area In Actual In Ha**	**Expenditure(Rs In Lakhs)**
	I YEAR			
(A) RECLAMATION & REHABILITATION OF MINED OUT : LAND/AREA	(i) Backfilling	Nil	Nil	Nil
	(ii) Afforestation on the backfilled area	Nil	Nil	Nil
	(iii) Others (please specify) e.g. Afforestation on exhausted benches.	Nil	Nil	Nil
	(iv) Pisciculture			
	(v) Converting into water reservoir	Nil	Nil	Nil
	(vi) Picnic Spot	Nil	Nil	Nil
(B) STABILIZATION & REHABILISATION OF DUMPS (within mining lease)	(i) Terracing			
	(ii) Pitching			
	(iii) Construction of Parapet Walls/ Retaining wall at toe of dumps (in mtr)/SG stack		300 meters	@Rs.150/M (Stone Pitching) **Rs.45,000**
	(iv) Construction of Check Dams along slope of valise		Nil	**Nil**
	(v) Construction of Settling Ponds (Garland drain etc.)		Garland drain -	Garland drain – **Rs.60,000/-**
	(vi) De-silting of settling ponds, channels		Nil	**Nil**
	(vii) Afforestation on dumps		Nil	Nil
	(viii) Others (Please specify)		Nil	Nil
(C) REHABILITATION OF BARREND AREA WITHIN LEASE	(i) Afforestation (Green belt building)		1000 no.	@Rs.10/- per tree including sapling, digging and planting – **Rs.10,000/-** Water per day 1 trips/Day for 250 days - **Rs. 27,000/-** Maintenance -**Rs. 28,500/-** **Total-Rs 65,500/-**
	(ii) Others (Please specify)			
(D) ENVIRONMENTAL MONITORING (Core zone & Buffer zone separately)	(i) Ambient Air Quality			**Quarterly monitoring – Rs.1,25,000/-**
	(ii) Water Quality (Surface and Ground water			**Quarterly monitoring Rs.1,25,000/-**
	(iii) Noise Level Survey			**Quarterly monitoring Rs.50,000/-**
	(iv) Ground Vibration			Once in a year **Rs.50,000/-**
	(v) Others (Please specify)			
Total				**Rs.5.205 lakhs**

YEARLY PROPOSAL FOR ITEM NO. 6 & 7 OF PMCP FOR 2017 -18(5th YEAR) FOR KRISHNA MINES IN RAMAYANPATTI OVER AN EXTENT 31.092 HA.				
Items	**Details**	**Area (Ha.) Prop**	**Area In Actual In Ha**	**Expenditure(Rs In Lakhs)**
	I YEAR			
(A) RECLAMATION & REHABILITATION OF MINED OUT : LAND/AREA	(i) Backfilling	Nil	Nil	Nil
	(ii) Afforestation on the backfilled area	Nil	Nil	Nil
	(iii) Others (please specify) e.g. Afforestation on exhausted benches.	Nil	Nil	Nil
	(iv) Pisciculture			
	(v) Converting into water reservoir	Nil	Nil	Nil
	(vi) Picnic Spot	Nil	Nil	Nil
(B) STABILIZATION & REHABILISATION OF DUMPS (within mining lease)	(i) Terracing			
	(ii) Pitching			
	(iii) Construction of Parapet Walls/ Retaining wall at toe of dumps (in mtr)/SG stack		300 mtrs	@Rs.150/M (Stone Pitching) **Rs.45,000**
	(iv) Construction of Check Dams along slope of valise		Nil	**Nil**
	(v) Construction of Settling Ponds (Garland drain etc.)		Garland drain -	Garland drain – **Rs.60,000/-**
	(vi) De-silting of settling ponds, channels		Nil	**Nil**
	(vii) Afforestation on dumps		Nil	Nil
	(viii) Others (Please specify)		Nil	Nil
(C) REHABILITATION OF BARREND AREA WITHIN LEASE	(i) Afforestation (Green belt building)		1250 no.	@Rs.10/- per tree including sapling, digging and planting – **Rs.12,500/-** Water per day 1 trips/Day for 250 days - **Rs. 27,000/-** Maintenance -**Rs. 28,500/-** **Total-Rs 68,000/-**
	(ii) Others (Please specify)			
(D) ENVIRONMENTAL MONITORING (Core zone & Buffer zone separately)	(i) Ambient Air Quality			**Quarterly monitoring – Rs.1,25,000/-**
	(ii) Water Quality (Surface and Ground water			**Quarterly monitoring Rs.1,25,000/-**
	(iii) Noise Level Survey			**Quarterly monitoring Rs.50,000/-**
	(iv) Ground Vibration			Once in a year **Rs.50,000/-**
	(v) Others (Please specify)			
Total				**Rs.5.23 lakhs**

8.0 Financial Assurance:

The financial assurance was calculated for the entire Mining lease area of 31.092 Ha. As the entire area is put to use for mining and its allied activities such as area under mining, area for dumping, area for Green belt, and area for haul road and allied services. The financial assurance is calculated as per the table given below in **Table No - 46**

Sl No	Head	Area put on use at start of plan (Ha)	Additional requirement during plan period (Ha)	Total (Ha)	Area considered as fully reclaimed & rehabilitated (Ha)	Net area considered for calculation (Ha)
1	Area of excavation	20.71	2.60	23.310	0.000	23.310
2	Storage of top soil	Nil	Nil	Nil	0.000	Nil
3	Overburden/dump	3.01	0.104	3.114	0.000	3.114
4	Mineral Storage/Sub grade	Nil	2.425	2.425	0.000	2.425
5	Infrastructure(Workshop/ Building)	0.33	Nil	0.33	0.000	0.33
6	Roads	0.17	Nil	0.17	0.000	0.17
7	Railways	Nil	Nil	Nil	0.000	Nil
8	Green belt	1.367	0.062	1.429	0.000	1.429
9	Tailing pond	Nil	Nil	Nil	0.000	Nil
10	Effluent treatment plant	Nil	Nil	Nil	0.000	Nil
11	Mineral Separation plant	Nil	Nil	Nil	0.000	Nil
12	Town ship area	Nil	Nil	Nil	0.000	Nil
13	Others	Nil	0.314	0.314	0.000	0.314
14	Area utilized	25.587	5.505	31.092	0.000	31.092
15	Area which will remain (Untouched)	5.505	Nil	0	0.000	0
	Total	31.092	Nil	31.092	0.000	31.092
GRAND TOTAL		**A**	**B**	**C=A+B**	**D**	**E=C-D**

The proposed plantation area is considered for assessment for financial assurance. In fact the financial assurance is considered for the entire lease area as the same will be put to use at the end of the scheme period.

As per Mineral Conservation and Development (Amendment) Rules – 2003 under Rule 23 (F). The lessee will have to provide financial assurance of Rs.25,000/Ha for the area utilized since the area falls in A-Category mine. The financial assurance for 31.092 Ha works out to Rs.777300/ (Rupees Seven Lakhs seventy seven thousand three hundred only). Copy of Bank Guarantee is enclosed vide Annexure No -17

Date: 22.07.2013 M.S.Jayaram

Place: Chennai RQP/MAS/173/2003/A