NUVOCO	**Pre Feasibility Report for the Environment Clearance of SONADIH LIMESTONE DEPOSIT, ML-2 (area 64.815 Ha), District – Baloda Bazar Bhatapara (Chhattisgarh) Nuvoco Vistas Corp.Limited (Formerly Lafarge India Limited)**

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REPORT ON

PRE-FEASIBILITY STUDY REPORT

As per Guidelines under 'The Mineral Evidence Rules, 2015'

In respect of

Sonadih Limestone Deposit ML-2

Area – 64.815 Ha

Villages –Raseda, Tahsil –Baloda Bazar,

District – Baloda Bazar-Bhatapara,

State – Chhattisgarh

Prepared for

M/s Nuvoco Vistas Corp. Ltd.
(Farmerly Lafarge India Limited)

Sonadih Cement Plant, Post- Raseda

District – Baloda Bazar-Bhatapara (Chhattisgarh)

Prepared by

Nitesh Raghuvanshi
Nuvoco Vistas Corporation Limited

Rajesh Singh
Nuvoco Vistas Corporation Limited

Name of applicant / lessee	**M/s Nuvoco Vistas Corp. Ltd.** **(formerly Lafarge India Limited) (NVCL)**
Rule 45 IBM registration Number	**IBM/378/2011**
Local correspondence Address	Sonadih Cement Plant Post – Raseda, Tehsil - Balodabazar
District	BalodaBazar - Bhatapara
State	Chhattisgarh
Pin code	493332
Phone	Phone +91-7727-227226 Fax +91-7727-272227
Email	nitesh.raghuvanshi@nuvoco.in
Status of applicant/lessee	Private Limited Company

Registered Office of the Company	Equinox Business Park (Peninsula Techno Park), Tower 3, East Wing, 4th Floor, Off Bandra-Kurla Complex, LBS Marg, Kurla-West, Mumbai-400070 Email: ujjawal.batria@nuvoco.in Phone: 022-66306511 Fax: 022-66306510

1.0 GENERAL

Mineral(s) which is the applicant / lessee intends to mine	Limestone
Name of Qualified person under rule 15 of MCR, 2016 preparing Mining Plan	**Nitesh Raghuvanshi and Rajesh Singh** **Nuvoco Vistas Corporation Limited**
Address	**Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited)** Sonadih Cement Plant, Post – Raseda, District - Balodabazar -Bhatapara, Mobile- 7869962751/9163323296.

Location of Mine/ area	
Village	Raseda
Tahsil	Baloda Bazar
Police station	Baloda Bazar
District	Baloda Bazar - Bhatapara
Pin code	493332

Toposheet No.	The area falls in Toposheet No. 64 K/1 and K/2.
Lat /Long of any boundary point /pillar fixed reference point (FRP)	The area falls between Latitudes 21^0 43' 31" to 21^0 44' 25" N Longitudes 82^0 11' 47" to 82^0 12' 36" E

1. **<u>Mineral Resource estimation for conversion to Mineral Reserve</u>:**

1.1 <u>Details of the Mine</u>:

Chronological history of the applied mining lease over an area:

S. No.	Chronology of PLs & ML	Date	Referred Document No
1	Prospecting License granted over an area of 86.35 Ha	24-Apr-02	F 2-126/2001/M
2	Prospecting License granted over an area of 180.012 Ha	25-Jan-06	F 2-28/2002/12
3	Prospecting License granted over an area of 21.959 Ha	13-Jan-06	F 2-38/2002/12
4	Prospecting License granted over an area of 128.147 Ha	18-Jan-06	F 2-80/2003/12
5	Applied for Mining Lease in Form D	31-Jul-06	Recieved at Collectorate Raipur
6	Tehsil Revenue Dept did the field inspection and corrected the Land Schedule of Applied area as 462.783 Ha and communicated the same to Collector	15-Apr-10	Kramank/55/Teh. Va-1/2010 Dated 15.04.2010
7	District Mining Office recommended 64.815 Ha area out of total applied 71.449 Ha	20-Jul-16	Letter forwarded to MoM, Naya Raipur
8	Mineral Resource Department, Govt. of Chhattisgarh issued letter of intent to grant mining lease for mineral limestone for the period of 50 years over an area of 64.815 Ha	17-Oct-16	AF3-41/2010/12 Dated 17.10.2016
9	Mineral Resource Department, Govt of Chhattisgarh issued letter sanctioning company name change from Lafarge India Private Limited to Nuvoco Vistas Corp. Ltd.	03-Nov-17	AF 3-86/2007/12(2) Dated 03.11.2017

During the preparation of the Mining Plan, under the provisions of MCR 2016, this Pre-Feasibility Study report has been prepared in fulfill the points given in the Mineral Evidence Rule 2015 and is submitted considering the complete project.

1.2 Details of the Applicant / Company:

Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited) is one of the leading players in Eastern, Central and North India; with high performance blended cements in Portland Slag Cement (PSC), Portland Pozzolana Cement (PPC) and Ordinary Portland Cement (OPC) variants. It has also forayed into value added products like construction chemicals, wall fill solutions and cover blocks.

Lafarge entered the Indian market in 1999, with the acquisition of the cement business of Tata Steel. This acquisition was followed by the purchase of the Raymond Cement facility in 2001. Then after Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited) has acquired Lafarge India in year 2016-17 through its cement business. Copy of Letter (No. AF 3-86/2007/12(2) dated 03/11/2017) received from Mineral Resources Dept., New Raipur on Change of Company's name from Lafarge India Pvt. Ltd. to **Nuvoco Vistas Corp. Ltd. in respect of all valid mining leases.**

Currently Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited) has six cement and close to sixty five ready mix concrete plants in India and has an established presence across all major cities and towns in India.

Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited) is operating six cement plants in India, two integrated plants in the state of Chhattisgarh, one in Rajasthan and one each grinding/ blending stations in West Bengal, Jharkhand and Haryana. Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited) produces and sells Ordinary Portland Cement, Portland Slag Cement, and Portland Pozzolana Cement. The Total cement production capacity of Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited) in the Indian market currently stands at around 11 million tonnes per year.

Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited) is having its registered office at Equinox Business Park. Tower-3, East Wing, 4th Floor, Off Bandra-Kurla Complex Kurla-West. Mumbai-400070. Ph: (022)66306511, Fax: (022) 66306510.
Nuvoco Vistas Corp. Ltd. (formerly Lafarge India Limited) mines and plants have received various awards from MOEF, Green Technical Foundation, NCBM, MOCCM, CII in relation to energy saving and mines have received awards from IBM and DGMS during MEMCW and mines safety week celebrations.

Sonadih Cement Plant, a unit of NVCL, is located near Sonadih village, Balodabazar Tehsil of Balodabazar-Bhatapara District in Chhattisgarh state. The present plant capacity is 3.5 mtpa

clinkers which require 5.5 million tonne per annum of limestone. This new mine with production capacity of 0.1 million tonnes per annum will full-fill the part of requirement. Out of the total clinker production, about 12-15% clinker is utilized at Sonadih Cement Plant for manufacturing of Portland Pozzolana Cement, while 85-88% clinker would continue to be sent to Jojobera grinding unit.

The particulars of different leases held by M/S Nuvoco Vistas Corp Ltd (formerly Lafarge India Ltd) limestone in India are details below:

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Sr No	Lease Reference no & date	Area in Ha	Postal Address/Location	Type of Mineral	Remarks
1	ML Registration No 1380 dated 15.01.1996	444.763	Village-SonadihP.O. Raseda, Via-Baloda Bazar, Dist-Raipur Chhattisgarh	Limestone	Valid upto14/01/2036
2	ML Registration No 3914+3915 dated 31.05.1979	499.987	Village-Arasmeta P.O. Gopal NagarTaluka-PamgarhDist-Janjgir-ChampaChhattisgarh	Limestone	Valid upto30/03/2030
3	ML Registration No 3890 dated 26.08.2000	167.048	Village-Kirari Chorbhatti P.O. Gopal Nagar Taluka-PamgarhDist- Janjgir-Champa,Chhattisgarh	Limestone	Valid upto 25/08/2050
4	ML Registration No 3365 dated 22.12.2015	1085.365	Village- Near Chilhati, P.O. Gopal NagarTahsil-Masturi,Dist-Bilaspur, Chhattisgarh	Limestone	Valid upto21.12.2065
5	ML Registration No 2588 Dated 18.11.2008	796.430	Village-Ravoor, Taluka-Chittapur,Dist-Gulbarga, Karnataka	Limestone	Valid upto 17/11/2058
6	ML Registration No 10/2006 Dated 14/05/2010	1476.425	Village-Arniya Joshi,Tehsil-Nimbehara Dist-Chittorgarh,Rajasthan	Limestone	Valid upto 13/05/2060
7	ML Registration No. 9A/1992 Dated 08.07.1993	602 Ha	Village-Sita Ram Ji Ka Khera Tehsil- Nimbehara,Dist-Chittorgarh, Rajasthan	Limestone	Valid upto 07/07/2043

Details of License:

NVCL has been granted Prospecting License over B, C, D, E & F Blocks admeasuring a total of about 508.633 Ha. by Govt. of Chhattisgarh prior to undertaking the prospecting activities.

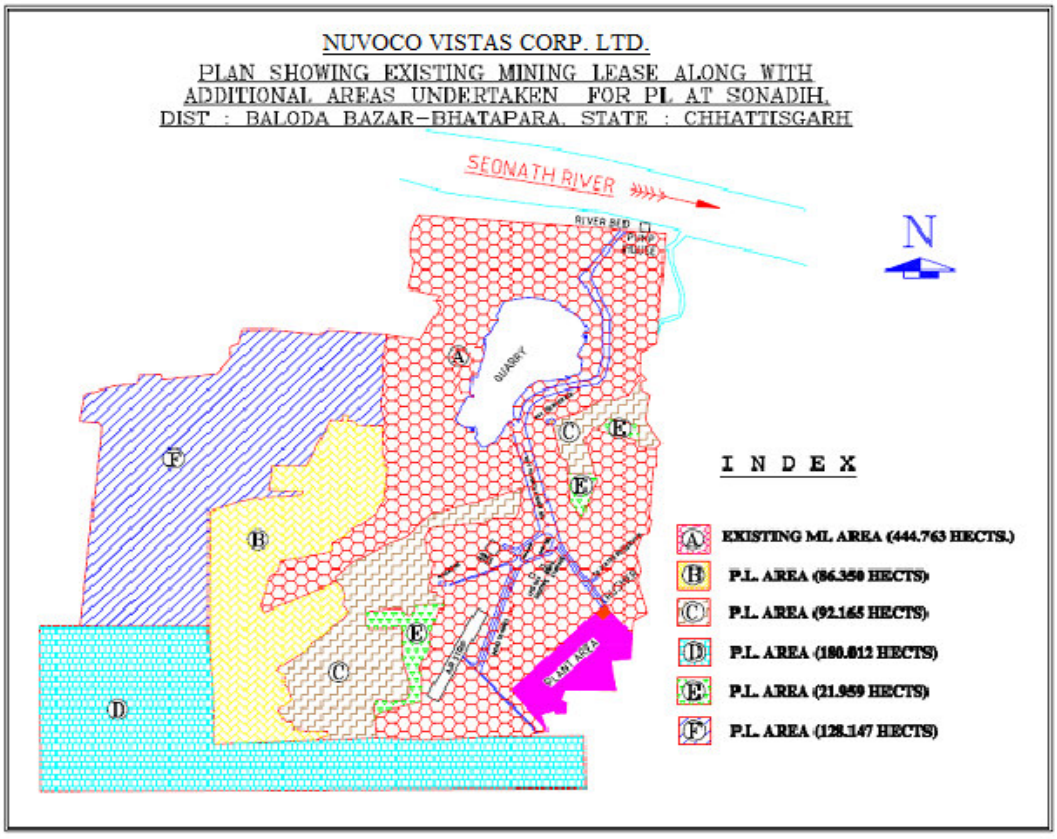
B–Block- Letter No- 2-126/2001/M dt 24/04/2002 over an area of 86.350 Ha.

C-Block - Letter No- 2-125/2001/12 dt 13 /1/2006 over an area of 92.165 Ha.

D-Block - Letter No- 2-28/2004/12 dt 25 /1/2006 over an area of 180.012 Ha.

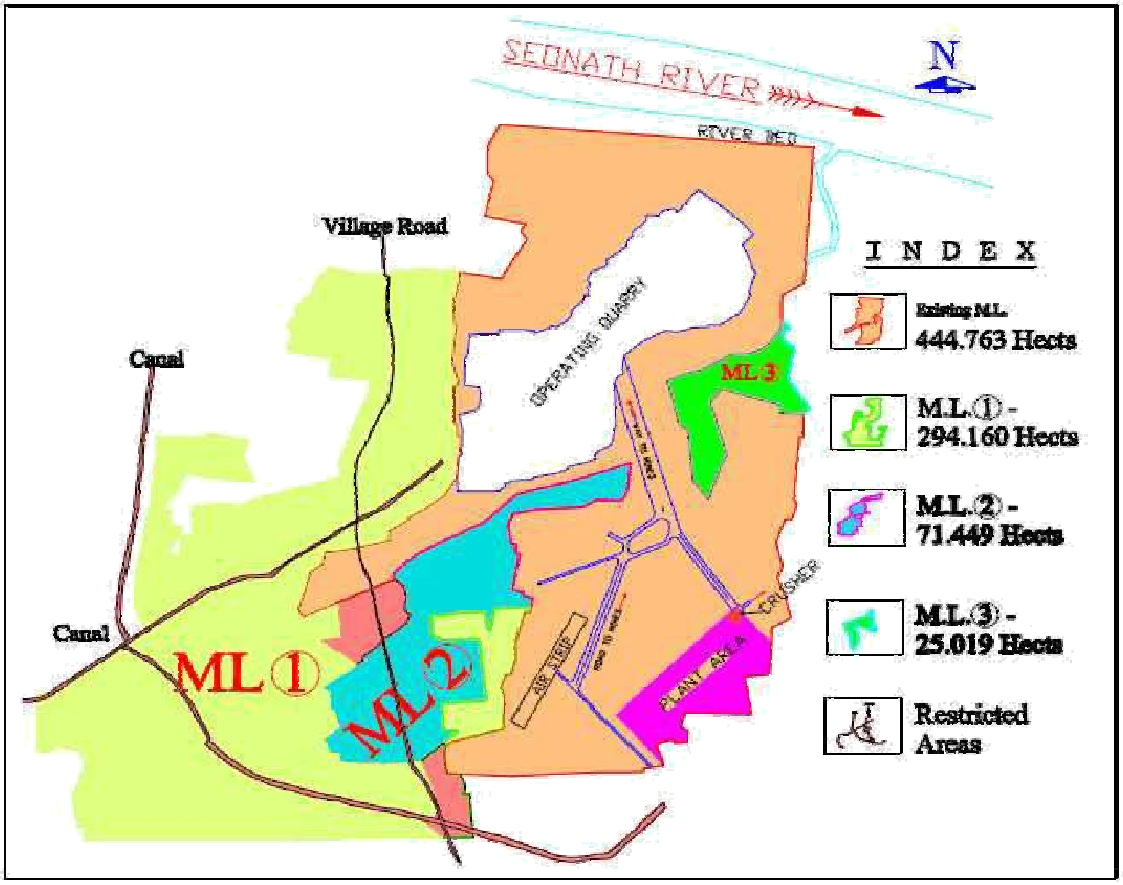
E-Block - Letter No- 2-38/2002/12 dt 18 /1/2006 over an area of 21.959 Ha.

F-Block - Letter No- 2-80/2003/12 dt 18 /1/2006 over an area of 128.147 Ha.



After successful completion of prospecting operation in two phases i.e. in 2002 & 2006, NVCL submitted 3 mining lease applications on 31.07.2006 covering all the above prospecting licenses. The details of ML applications are as under:

Lease No.	Taluk	Village	Area (Ha.)	Ownership/ Occupancy
1	Baloda Bazar (Chhattisgarh)	Sonadih, Raseda, Dhabadih, Kesdabri & Boirdih	462.783 **(Recommended area 294.16 Ha.)**	Govt. & Private Ownership
2	Baloda Bazar (Chhattisgarh)	Raseda	71.449	Forest Land
3	Baloda Bazar (Chhattisgarh)	Khapri	25.019	Forest Land & Private land



Details of exploration agency:

After execution of the prospecting licenses, **NVCL** (formerly Lafarge India Ltd.) entrusted the job of exploration
to M/s. Drilltech Consultant, Kolkata under work order no SCP/O1N95/259056/1/1 dated 5th Jul 2002 and later vide Work Order No. LIPL/CPO-SER/EOO/GEO/SCP/05/5370 dated 18th May 2005. The address of the prospecting agency is as follows:
Drilltech Consultant,
Pratapadiya road,
Ground Flooor,
Kolkata- 700026

Details of the area (Location and extent of Applied ML area):

District & State	Tehsil	Village	Area	Ownership
Balodabazar-Bhatapara & Chhattisgarh State	Baloda Bazar	Raseda,	(Ha) 64.815	of land Bade jhad ka jungle

Infrastructure & Environment

The applied ML area falling in the village Raseda in Tehsil Balodabazar, District Balodabazar-Bhatapara are located at about 100 km NNE of Raipur city and 10 km. from Baloda Bazar Town in the district of Balodabazar- Bhatapara, Chhattisgarh State.

The nearest railway station Bhatapara, is located at about 35 km from the applied ML areas on Mumbai-Howrah main line of South-Eastern Railway.

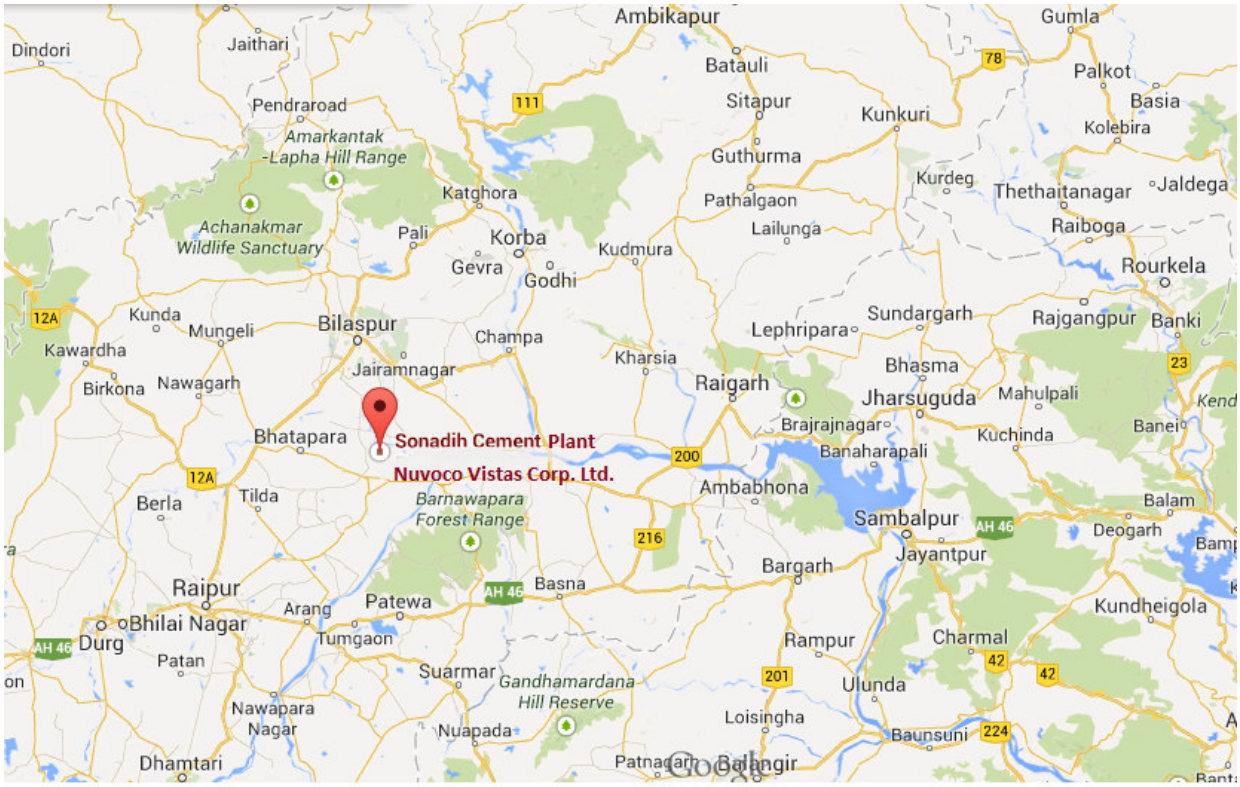
The nearest airport is Raipur about 100 km towards south west from the applied ML area and is well connected by flights from Delhi, Mumbai, Chennai, Nagpur, Bhubaneshwar, Vishakhapatnam, Hyderabad etc.

The distances to important nearby cities/ towns from applied ML area are as follows and location is shown below:

Baloda Bazar (nearest town)	10 km
Bhatapara (nearest railway station)	35 km
Nipania (nearest railhead)	24 km
Raipur (State Capital)	100 km

No historical sites, sanctuaries, national park or eco sensitive areas are present in and around the recommended ML area.

1.3 Location of applied ML area



Geology & Reserves:

Topography: The topography of the area is almost a flat having gentle slope from SW to NE direction. The maximum contour level is 255 mRL near the SW boundary and minimum is 242 mRL near the NE boundary. The applied lease area is divided into 2 Blocks.

Drainage pattern: The Shivnath River flows from north to south and suddenly takes turn near the northern boundary of the existing lease of the company which is about 2 km from this lease area and flows towards ESE direction.

The River Shivnath and its tributaries viz Khorsi Nala and Jamuniya nala control drainage of the area. Various streams originate from this and forms a network to join this nala, which finally flows in SW-NE direction and meets the river Shivnath exhibiting dendritic pattern in the most of the area. Beloda branch of the Mahanadi canal enters the area from SSW part of the lease area and passes towards northern part distributing water to the villages in its course. All the seasonal nalas flow into the Shivnath River.

Vegetation: The common species in nearby villages are Babool, Neem, Pipal, Bargad,

Imli, Amla, Gulmohar, etc.

Climate: The area has sub-tropical climate with average annual rainfall ranging from 80 to 90 cm. The rainy season starts from June to September with maximum rain fall in the month of August. Sometimes intermittent showers accompanied by storm are experienced in March and April before the on-set of monsoon. May is the hottest part of the year with temperature going upto 47^0C while the usual temperature ranges between 27^0C and 42^0C. January is the peak winter with temperature varying between 28^0C and 13^0C.

The ground water level monitored around the applied area was found to be in the range of 30 - 35 m, which corroborates from the finding of adjacent existing operation. The limestone is hard, compact and massive in nature and devoid of any secondary porosity like joint, fissures etc. to have potential ground water occurrence. Adjacent mining operation has reached up to a depth of 32 m and ground water has not yet encountered.

Regional geology:

The Regional Geology has been from the miscellaneous publication No. 30, PART XXI, 2ND Revised addition, 2006 of Geological Survey of India, "Geology and Mineral Resources of Chhattisgarh".

The limestone and associated formation which is occurring near this village a part of Chhattisgarh Synclinorium and belonging to Chandi Formation of the Raipur Group of Chhattisgarh Supergroup. The limestone deposit is almost horizontally bedded with local dip from 2^0 to 5^0 towards north. The general strike of the limestone bed is east-west.

The interacratonic Chhattisgarh Basin is crescent shaped and covers about 33,000 sq km area in Raipur, Durg, Rajnandgaon, Bilaspur and Raigarh district of Chhattisgarh and adjoining parts of Orissa. The basin has a maximum length of about 300 km along ENE-WSW direction. The maximum thickness of sediments is estimated to more than 2 km and is epicontinental or stable shelf type.

Local Geology (Lithology of the area):

Generally grey limestone are found on the northern part of the area followed by purple grey limestone and purple shale successively towards south and similarly the same sequence has been confirmed from borehole drilled during exploration. The deposit is structurally undisturbed since basin deposition.

The local succession of the area is as under:

Soil (alluvial)	
Dolomite Grey Limestone	Chandi Limestone formation
Purple - Grey Limestone	
Purple Limestone	
Purple Shale	Gunderdehi Shale

Limestone is extremely fine grained, anhedral and occurs as massive, hard compact body. Colour of limestone generally has a close relationship with quality. It is observed that the

grey limestone have higher CaO content and less MgO content than the underlying purple limestone which has the intercalation of purple shale in depth.

Technological Investigation (Exploration):

Details of technological investigation (pitting/trenching/drilling etc.):

A systematic geological investigation over the recommended ML area was conducted by NVCL. The geological investigations include topographic survey, geological mapping, and diamond core drilling and surface sample analysis.

Subsequent to the grant of the PL, NVCL formulated an exploration program for the PL area. The execution of the exploration campaign was carried out under supervision of NVCL. The exploration activities were carried out in two different phases in the years 2002-2003 and 2006, respectively.

Initially, a thorough reconnaissance of the PL area was carried out, in order to assess the potential area to start with the prospecting operations and exploration restricted within recommended ML potential limestone bearing area with no mining constraints. As stated earlier, the entire area is concealed beneath soil cover, hence the lithologies exposed in dug wells/ dug pits formed the basis for borehole planning and subsequent exploration activities.

Altogether a total of 30 vertical boreholes were drilled with a total meterage of 940 m in granted total PL area. The summary of exploration activities carried out by NVCL during geological exploration campaign is given in the table below:

Exploration Activity	Quantum of work
No. of Core Boreholes	30 nos.
Grid pattern	150 m x 150 m
Total meterage	940 m
Sample analysis for 8 radicals (CaO, MgO, SiO2, Al2O3, Fe2O3, Na2O, K2O and LOI)	495 nos.

Data spacing for reporting of Exploration Results:

The scheme of investigation for proving existence of cement grade limestone at granted PL blocks was suitably framed by NVCL (formerly Lafarge India Ltd.) involving topographical survey, geological mapping, diamond core drilling, logging & sampling, chemical analysis and preparation of prospecting report.

Topographical survey of entire area was done with the help of total station. Surveying and plotting on the drawing were done for all the ground features and structures falling within the survey limit. However the area being contiguous to existing operating mine and more or less flat and devoid of any major structures, the survey work mainly consisted of drawing of grid lines at 150 meter intervals at field in the same line as it was done for proving existing mining area. All the surface features were noted and contour map was prepared in 1:5000 scale with 1 m contour interval.

Since the area is adjacent to existing mine working, therefore pitting and trenching was not done. During the course of detailed exploration, total 30 boreholes were drilled in the area on a grid pattern of 150 m X 150 m.
The grid pattern for regular deposits like limestone should be less than 200 m X 200 m for considering the reserve under G-1 category, thus the exploration work carried out by NVCL at the area held under prospecting license and established reserve can be considered under the G-1 category.

Location of Data Points:

The recommended ML area of 64.815 Ha has been covered under topographical survey. The topographic map was prepared on a scale of 1:2000 with a contour interval of 1.0 m. Considering this, locations of the total 30 nos. of bore holes were placed and collar were identified during the exploration campaign.

The topographic plan has formed the base for the geological plan. The entire geological setup of the recommended ML area comprising of the existing lithological sequence and their structure is superimposed on the topographic plan to generate the geological plan. - Quality and adequacy of topographic control.

Survey was carried out with the help of Total Station with reference to the coordinate N– 3000, E – 3000, RL – 234.550 M from borehole 11/86 of Block – A (existing mining lease).

Surveying and plotting on the drawing were done for all the ground features and structures falling within the survey limit. However, the area being more or less flat and devoid of any major structure, the survey work mainly consisted of drawing on perpendicular grid lines at 150 m intervals at field in the same line as it was done for Block-A, the existing mining lease. All the grid intersection points were established on the field by fixing pillars with their respective co-ordinates and their respective reduced levels. All the surface features were noted and contour map was prepared in 1:2000 scale.

Sampling Technique:

Proper sampling equipment (PW 4400 AXIOF- XRF) was used to ascertain iron-free milling and pulverization subsequent to chipping by jaw crusher. Two sets of powdered samples were prepared from the split –half core by standard method of coning and quartering and sieving to 100 mesh powders. The standard practice of levelling envelopes was followed. One set of sample was utilized for conducting chemical analysis and the other set was preserved for future reference. The sampling was done by NVCL's expert.

Drilling Technique & Drill Sampling Employed:

Diamond core drilling was undertaken in vertical boreholes in NX size by double tube core barrel arrangement. Drill rigs of Voltas and L & T make (Model- Joy 12 B, LT 175) having a capacity of 100 – 300 m along with all relevant accessories and well-trained drill crew were employed during the exploration campaign.

The minimum and maximum run wise core recovery achieved in the bore holes drilled is 0% (in overburden soil region, where sludge samples were collected) and 100% respectively.

Drilling was undertaken over entire area on prefixed grid interval of 150 m with the help of 13 diamond core drilling rigs. A total of 30 boreholes were drilled covering 940 m cumulative drilling.

-**Whether core and chip sample recoveries have been properly recorded and results assessed.**

The run wise recovery from each of the boreholes was properly recorded and analyzed for their LOI, SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O and K_2O contents. The individual lithounits

along with the contacts as established from the core was noted and sample intervals marked

-Measures taken to maximise sample recovery and ensure representative nature of the samples.

Diamond core drilling machine of reputed make Voltas and L & T make (Model- Joy 12 B, LT 175) having a capacity of 100 – 300 m with double tube core barrel, connected to a consumable core drilling bit, typically made with synthetic diamonds, which is the core cutting tool were used for drilling to maximise sample recovery and ensure representative nature of the samples.

- **Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.**

Core recovery in the overburden soil region, where sludge samples were collected are very less, whereas core recovery over massive limestone is up to 100%. In case of Dolomite and Dolomitic limestone also the core recovery is high. Limestone in contact with the soil, clay, clay pockets and shaley limestone are encountered less recovery with inferior grade.

-**Logging: -Whether core and chip samples have been logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.**

Core samples recovered run wise from the boreholes were logged throughout the length of the borehole lithologically on the basis of visual inspection. The individual lithounits along with the contacts as established from the core was noted and sample intervals marked.

Sub-Sampling Technique and Sample Preparation:

-**If core, whether cut or sawn and whether quarter, half or all core taken.**

Individual core samples representing thickness of lithological units of interest or part thereof were drawn by splitting the core in two equal parts.

-If non-core, whether riffled, tube sampled, rotary split etc. and whether sampled wet or dry.

Not Applicable

-**For all sample types, the nature, quality and appropriateness of the sample preparation technique.**

One half of the core was retained in the core box and other was crushed and two sets of powdered samples were prepared from the split – half core by standard method of coning and quartering and sieving to 100 mesh powders. The standard practice of levelling envelopes was followed. One set of sample was utilized for conducting chemical analysis and the other set was preserved for future reference.

-**Quality control procedures adopted for all sub-sampling stages to maximize representivity of samples.**

Half split core samples were systematically crushed, coned quartered by applying grain size/quantity principles for forming representative powder sample. PW 4400 AXIOF- XRF sampling equipment was used to ascertain iron-free milling and pulverization subsequent to chipping by jaw crusher.

-**Measures taken to ensure that the sampling is representative of the in situ material collected.**

Diamond core drilling was conducted and all the samples were collected from the drilled bore holes to ensure the sampling is representative of the in situ.

-**Whether sample sizes are appropriate to the grain size of the material being sampled.**

Since limestone grain size is medium to fine, all the samples were sieved to 100 mesh powders for chemical analysis purpose.

Quality of Assay Data and Laboratory Tests:

All the individual samples prepared from the drill cores were analysed for their 8 radical constituents viz CaO, MgO, SiO2, Al2O3, Fe2O3, Na2O, K2O and LOI in the laboratory of Sonadih Cement Plant of NVCL by using most advanced sampling technique of XRF analysis using PW 4400 AXIOF instrument.

The weighted average core quality for the CaO & MgO of the cement grade limestone was calculated from the analysis results.

Limestone	CaO (%)	SiO2 (%)
Grey Limestone	42.00-48.00	08.00 – 11.50

Moisture: The tonnages are estimated with the natural moisture content.

Bulk Density:

The Specific Gravity (SG) of limestone has been assumed as 2.5 which is the standard value for limestone. In general Specific Gravity of limestone varies from 2.3-2.7. One cubic meter of in-situ limestone by volume has been considered to be equivalent of 2.5 tonnes by weight. OB soil bears a SG of 1.8, the interstitial clay bears the SG of

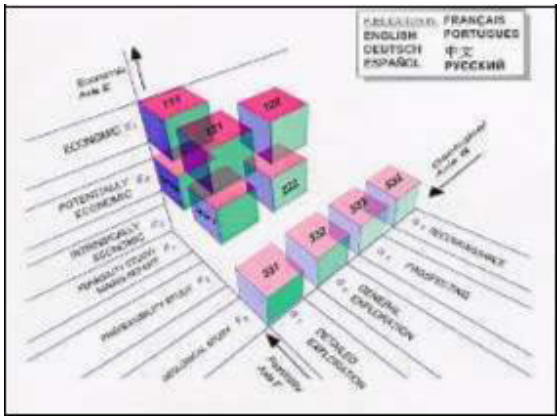
1.2, Shale bears a SG of 2.2, whereas all other lithounits bears the SG of 2.5 (same as limestone).

Resources Techniques:

The methodology adopted for estimation of resources is as follows:

Geological Cross Sectional Method

In consideration of the intensity of exploration carried out, the geological/ structural setup of the deposit and configuration of concession area clubbed with a number of constraints, estimation of limestone resources on the basis of geological cross sectional method has been adopted for limestone resource estimation. The cross sectional area was multiplied by 150 m, considering 75 m aerial extent on either side of the section line on north south. The quantity of overburden and rejects to be mined along with limestone has also been calculated by cross sectional method.



The cross sections have been drawn along the section lines trending East-West on drilling grid and attitude of beds. In order to know the lateral and depth wise extent of mineralization, the lateral limits of mineralization on the cross sections have been marked on the basis of correlation with subsurface geology based on structural disposition and chemical analysis of core samples generated during drilling.

Surface Area

The explored area falls under different categories were drawn in plan on the basis of their limits on cross sections and lateral limits extended. In addition to this, polygons for different constraints were also drawn and superposed over the exploration category polygons in order to calculate the area blocked under different category. All the polygons so made were assigned separate identity.

Specific Gravity (SG)

The Specific Gravity (SG) of limestone has been assumed as 2.5. One cubic meter of in-situ limestone by volume has been considered to be equivalent of 2.5 tonnes by weight. OB soil bears a SG of 1.8, the interstitial clay bears the SG of 1.2, Shale bears a SG of 2.2, whereas all other lithounits bears the SG of 2.5 (same as limestone).

The SG values, for tonnage calculation, were applied to the litho units which were estimated.

Tonnage Calculation

The formula used for resource estimation is given below:

Tonnage = CA x AE x Sp. Gr.

Where, CA = Cross sectional Area of limestone/ other litho unit (m^2)

AE = 150 m Aerial Extent of section line of limestone/ other litho unit (m) Sp. Gr.= Specific Gravity

Further work:

The exploration work carried out at recommended mining lease, already covered lateral extension and depth of the area as per UNFC classification under G1 Category, hence no further exploration has been proposed in applied ML area.

Any Other Information:

NVCL has invested an amount of Rs. 1.04 Crores for systematic and scientific exploration of the all sanctioned PL areas.
Mineral Resource Estimation for Conversion To Mineral Reserve Categorization Of Resources:

The reserves and resources of limestone have been estimated as per the UNFC guidelines by cross-sectional method. In consideration of the intensity of exploration carried out, the geological/ structural setup of the deposit and configuration of concession area clubbed with a number of constraints, estimation of limestone resources on the basis of geological cross sectional method has been adopted for limestone resource estimation. The cross sectional area was multiplied by 150 m, considering 75 m aerial extent on either side of the section line on north south. The quantity of overburden and rejects to be mined along with limestone has also been calculated by cross sectional method.

The cross sections have been drawn along the section lines trending East-West on drilling grid and attitude of beds. In order to know the lateral and depth wise extent of mineralization, the lateral limits of mineralization on the cross sections have been marked on the basis of correlation with subsurface geology based on structural disposition and chemical analysis of core samples generated during drilling. The parameters considered for reserve estimation are as under:

i) The total applied lease area is 64.815 Ha and has been divided into 2 blocks.

ii) Mapping: The lease area has been surveyed by Total Station and preparing detailed topographical-cum-geological map including all surface geological features, extent of deposit, structural features, location of bore-holes and the assay-plan has been prepared on 1 : 2,000 scale with contour interval of 1 m, accordingly the Surface Plan has been prepared.

iii) The grid along with temporary survey station points have been marked on the maps.

iv) The general surface level of the area is 246 mRL, maximum surface level of the area is 255 mRL and minimum is 242 mRL.

v) A total 30 vertical core bore-holes were drilled in the area, at 150 x 150 m grid interval.

vi) The reserve has been estimated by cross-sectional method. The limestone bearing areas have been estimated by cross-sectional method and its influence area.

vii) The depth continuity of mineralization has been considered limited to the depth upto wich direct evidence on mineralization is established through the boreholes.

viii) The quality requirement of limestone for Cement Plan is under:

CaO%	42 ± 2
MgO%	3± 1
SiO2%	10± 2

ix) Limestone occurring in this area has been divided into three different categories so that required feed to the cement plant is achieved by proper blending, so that the required quality is obtained on day to day basis.

Classification	CaO %	MgO%
Cement grade limestone (CGL)	+42	Max 4
Blendable limestone (BLST)	38 – 42	Max 4
Sub-grade limestone (SUB)	34- 38	Max 4

x) The bulk density of limestone has been considered as 2.5.

xi) In the major part of the area, the top surface level varies from 250 - 242m. Therefore, from mining point of view, a level of 250 m has been taken for making the lower benches of 8 m each and, the accordingly the bench-wise reserve has been estimated.

xii) The reserve has been estimation block-wise and bench-wise separately.

The limestone of the area is stratiform, stratabound, tabular of regular habit and as the detailed exploration by drilling boreholes on 150 x 150 m spacing on grid pattern has been carried out over the entire lease area covering all the eight blocks,
the resources estimated has been categorized under Measured Mineral Resources, Code (331).
But, some portion of the applied lease area is devoid of boreholes or very far away from the borehole drilled, thus these areas has been considered under Indicated Mineral Resources, code (332).
The total reserves and resources are as under:

The total Mineral Reserves / Resources of Limestone for G-1 level:

S. No.	Particulars	Resources of limestone (tonnes)	Blocked out resources (tonnes)	Mineable Reserve (tonnes)
1	Cement grade limestone	15602625	3664913	11937712
2	Blendable grade limestone	4421250	1641600	2779650
3	Total	20023875	5306513	14717362
4	Sub-grade	2136375	--	--

The total Mineral Reserves / Resources of Limestone for G-2 level:

S. No.	Particulars	Resources of limestone (tonnes)	Blocked out resources (tonnes)	Mineable Reserve (tonnes)
1	Cement grade limestone	4656150	804938	3851212
2	Blendable grade limestone	2256188	799875	1456313
3	Total	6912338	1604813	5307525
4	Sub-grade	605138	--	--

Cut off parameter:

The quality requirement of limestone for Cement Plan is under:

CaO%	42 ± 2
MgO%	3± 1
SiO2%	10± 2

Limestone occurring in this area has been divided into four different categories so that required feed to the cement plant is achieved by proper blending at the crushing plant, so that the required quality is obtained on day to day basis.

Classification	CaO %	MgO%
High grade limestone (HLST)	+44	Max 3.5
Cement grade limestone (CGL)	42 – 44	Max 4
Blendable limestone (BLST)	38 – 42	Max 4
Sub-grade limestone (SUB)	34 - 38	Max 4

3. Mining Method:

3.1 Mining:

The company is having cement plant of 3.5 MTPA clinker capacity in village Sonadih, for this 5.5 million tonnes of limestone will be required.

The production rate of limestone will be depends upon production of limestone from all the mines of the company.

The mine will be designed and the deposit will be exploited with minimum damage to environment and optimum utilization of limestone for captive use in the Cement Plant.

The salient features of mine design will be as under:

(i) The overburden is in the form of top soil cover, murrum, yellow soil and clayey material of variable thickness. The overburden will be removed by dozer and transported by

excavator-dumper combination to the stock yard on non-mineralized zone. This material will be utilized for plantation within the non-mining zone.

(ii) In the major part of the area, the top surface level varies from 250 - 242m. Therefore, from mining point of view, a level of 250 m has been taken for making the lower benches of 8 m each and, the accordingly the bench-wise production will be taken up.

(iii) The working will be carried out in 3 shifts.

(iv) In the narrowing zones, the bench height will be reduced at 3 to 6 m.

(v) Limestone is bedded deposit, massive & compact in nature, hence, the ultimate

pit slope of 50^0 will be quite stable. For a bench of 8 m height, floor width of 6 m will be maintained. Presently, the working width will be maintained at about 20 m.

(vi) The rain-water and seepage water collected in the pit will be stored in the lower benches and will be used for spraying on the haul-roads and plantation.

(vii) The floor of the working faces will be kept slightly sloping to facilitate flow of water towards the sump during rainy season to keep the working faces dry.

(viii) For blasting, 104 mm dia and 8 m (+0.5 m perihole) will be drilled with compressed-air-operated wagon drills. The blasting will be done by ANFO/SME/Slurry as column charge and slurry /cast booster explosive as booster charge. Controlled blasting will be practiced by using Nonel detonators.

(ix) Hydraulic rock breaker will be used for breaking oversized boulders in place of secondary blasting.

(x) Hydraulic excavator of 3.5 cum capacity will be used in combination with 35 tonner dumpers for loading and transportation of limestone.

(xi) The crushed limestone will be directly transported to the cement plant after crushing and screening (if required).

(xii)The haul distance from mine site to crusher is about 3 to 5 km.

(xiii) For the purpose of grade control, samples will be drawn from each blast/blast holes and will be analysed for its grade.

(xiv) The limestone occurring in this area has been divided into four different categories so that required feed to the cement plant is achieved by proper blending at the crushing plant, so that the graded quality is achieved on day to day basis.

(xv) The sub-grade of limestone produced from the mine will be separately stacked and processed by suitably blending as per requirement. The blending ratio will vary according to parameters of raw mix from time to time.

(xvi) The Staker – Reclaimer and Raw-Mills operations will be governed by Production and Quality Control department of the Cement Plant, which will also co-ordinate with Mine Management to dispatch particular quality of crushed limestone as may be required, so that the Raw-Mix design suits the required parameters i.e. LSF, SM and AM, etc.

(xvii) All efforts will be made considering eco-friendly mining in the area. For this, dense plantation will be done all around the lease area in the non-mining zone to improve aesthetic beauty and for development of green belt.

(xviii) The mining loss during the mining of limestone is expected as about 10% of the total ROM due to intercalations, fractures, clay pockets, voids, cavities, etc.

Out of this, 5% will be considered as waste/intercalations and kept separately and remaining 5% will be due to voids and cavities.

Year Wise Production Proposal:

Year	Pit no	Total ROM (cum)	Volume of Limestone (90% of ROM) (cum)	Volume of Reject/waste (10% of the ROM) (cum)	Mineral (tonnes)
(1)	(2)	(3)	(4)	(5)	(7)
I YEAR	1	88,200	79,380	8,820	1,98,450
II YEAR	1	1,78,260	1,60,434	17,826	4,01,085
III YEAR	1	2,62,320	2,36,088	26,232	5,90,220
IV YEAR	1	3,53,320	3,17,988	35,332	7,94,970
V YEAR	1	4,40,050	3,96,045	44,005	9,90,113
Total	--	13,22,150	11,89,935	1,32,215	29,74,838

3.2 **Equipments for allied operation and Machineries related to Mining of deposit are as under:**

The equipments / machineries required for mining and allied operations related to

Mining are as under:

	Name	Nos.	Type/ make /Capacity	Purpose	Motive Power
1	DTH /wagon drill	1	ICM 260/ IR /104 mm	For drilling limestone bed	Diesel Engine
2	DTH /wagon drill	1	DH 150 / SANDWIK/ 104 mm	For drilling limestone bed	Diesel Engine
3	Hydraulic Excavators	1	TELCO (EX600 V)/ 3.5 cum bucket capa.	For loading OB and excavation of limestone and loading the same into dumpers	Diesel Engine

4	Pay Loader	1	HM 3.1 cu m Bucket cap	For loading OB and excavation of limestone and loading the same into dumpers	Diesel Engine
5	Dumpers	12	HAUL PAK / BEML/35 T	For transportation of limestone to C & S plant	Diesel Engine
6	Dozer	1	--	For dozing of OB	Diesel Engine
7	Hydraulic rock breaker	1	--	For reduction of oversized boulders	Diesel Engine
8	Water Tanker	2	28,000 liters	For sprinkling of on quarry road and blasted mass	Diesel Engine
9	Water pump	2	75 HP	For dewatering the working pit during the rainy season	Electrical pumps
10	Explosive van	1	--	For transporting the explosive	Diesel Engine
11	Jeep /Pool car	1	--	For supervision	Diesel Engine

3.3 Employment potential:

(i) Management & Supervisory Personnel: All mining operations will be under the charge of General Manager (Mines). The following managerial, technical & qualified staff will be employed.

S. No.	Highly Skilled Man power	No.
1	Mines Manager (Ist class certificate holder)	01
2	Asstt. Manager Mines (Ist or IInd class certificate holder)	01
3	Geologist	01
4	Mining Engineer	01
5	Mechanical Engineer	01
6	Electrical Engineer	01

	Total	**06**
S. No.	**Skilled Man power**	**No.**
1	Mining Foreman (certificate holder)	04
2	Blasting Foreman	01
3	Mechanical Foreman	03
4	Electrical Foreman	03
5	Store Officer	01
6	Security Officer	01
7	Mine Surveyor	01
	Total	**14**
S.No.	**Semi-Skilled Man power**	**No.**
1	Drill machine operator (experienced)	02
2	Excavator operator (experienced)	02
3	Dumper operator (experienced)	03
4	Compressor operator (experienced)	02
5	Rock breaker operator (experienced)	01
6	Dozer operator (experienced)	01
7	Mechanical, Electrical, Blasting	05
8	Time Keeper	02
9	Security	10
	Total	28
1	Unskilled labour for housekeeping, plantation	10
	Total	**10**

Note: Apart from the above, for maintenance of roads, making drains, fencing & other miscellaneous jobs will be done up on contractual basis.

Infrastructure and Services:

The essential facilities like first-aid station, drinking water arrangement, canteen, rest shelter, urinal, mine office, maintenance shed etc will be provided in the mine.

4. Metallurgical factor:

The limestone produced in this mine will be directly sent to cement plant, thus the metallurgical factor does not apply.

5. Cost and revenue factor:

The Mining Lease is captive to the Cement Plant. The details of Economic Evaluation is tabulated below:

Capital Cost:

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S. N	Head	Expenses
i	Cost of land (NPV, Compensation, afforestation, safety zone management etc) (@ 10/- lakh /Ha)	6,48,15,000/-
ii	Cost of Mining Equipment (Inclusive of Taxes & Excise duties as applicable)	15,00,00,000/-
iii	Crushing& screening unit with Environment control Equipments(Inclusive of Taxes, Duties, Insurance as applicable, erection &Commissioning cost)	
iv	Construction of Crusher Hopper, Crushing plant & Load Centre Building	
v	Construction of Mine Office Workshop, garage building, canteen, VT center, hospital etc	1,00,000/-
vi	Construction of first aid station	1,00,000/-
vii	Cost of Misc. items	10,00,000/-
viii	Water pipeline, Bore wells, Sprinklers for dust suppression & water reservoir for harvesting	100,00,000/-
ix	Cost of Mining plan and EIA/EMP studies etc	10,00,000/-
x	Total investment required	2270,15,000/- (say 22.70 crore)

* Since the area is under forest land, the cost of land is tentative.

Depreciation and profit & interest

Head / Year	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year
Depreciation for Eqpt										
Depreciation Cost	15000000	15000000	15000000	15000000	15000000	15000000	15000000	15000000	15000000	15000000
Depreciation for Site Services										
Depreciation Cost	1600000	1600000	1600000	1600000	1600000	1600000	1600000	1600000	1600000	1600000
Depreciation for Mine Plan, & EMP										
Depreciation Cost	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000
Mine Closure Cost										
Plantation Cost	500000	500000	500000	500000	500000	500000	500000	500000	500000	500000
Mine Closure Cost	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000
Total Cost (Rs)	700000									
Mine Closure Cost per Year	140000	140000	140000	140000	140000	140000	140000	140000	140000	140000
Operating Cost										
Mining Cost	250	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00

Transportation Cost	10	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Royalty	90	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00
Environment Cess on Royalty @5%	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Infrastructure Cess on Royalty @5%	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Welfare Cess	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Income Tax on Royalty @ 2.06%	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
ROM Cost	362.85	362.85	362.85	362.85	362.85	362.85	362.85	362.85	362.85	362.85
Closure Cost	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Rehabilitation Cost	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Plantation Cost	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Depreciation Cost	83.50	41.75	27.83	20.88	16.70	16.70	16.70	16.70	16.70	16.70
Production (Mine) (T)	200000	400000	600000	800000	1000000	1000000	1000000	1000000	1000000	1000000
Total Production Cost (Rs)	450.55	408.80	394.89	387.93	383.75	383.75	383.75	383.75	383.75	383.75
Assumed Selling	2000	2000	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00

Cost										
Profit Rs / Tonnes	1549.45	1591.20	1605.11	1612.07	1616.25	1616.25	1616.25	1616.25	1616.25	1616.25
Profit before Interest	309889200	636478400	963067600	1289656800	1616246000	1616246000	1616246000	1616246000	1616246000	1616246000
Interest Rate	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
Interest on Amount	227015000	--	--	--						
Interest Amount	27241800	--	--	--						
Profit after Interest	282647400	643154288	1046922003	1499141843	2005628064	2246303432	2515859843	2817763025	3155894588	3534601938

Thus, total cash flow, NPV, IRR and payback period will be:
Based on the return on equity/cash flow this project is of good economic viability.

Capital Cost: - 2270,15,000/- (say 22.70 crore /-)

Production Cost: - 450/- per Tonnes.

Transportation Cost: - 10/- per Tonnes.

Royalty: - 250/- per Tonnes.

NPV: - 4512072009/-

IRR: - 206%.

Pay Back Period: - 2 years.

Other Factors:

All the statutory provisions relating to labour, land acquirement, mining and taxation are being complied. The labour are well paid and taken care of health and also taken care at that time of any injuries/ accidents. The Mining operations are carried out as per the DGMS and Central Govt. and State Govt. norms. The Lessee is not have any dues to the State Govt. All the taxes are paid.

The Lessee has been holding mining lease, since more than two decades. It did not encounter any legal problem related to tribal issues or National Park or Forest department so far, since neither of these issues exist at all. Thus the company has been enjoying hassle free possession of the property and no trouble in this context is possible.

6.0 Market Assessment:

a. Type of Commodity with use:

Limestone produced from the mine will be utilized for captive requirement of the cement plant. Final product of the cement plant is various grades of cement.

b. Prospective Buyers :

Housing, Infrastructure, Commercial Construction and Industrial segments (Cement).

c. Present Sale Price:

Based on the market study, the target market for sale of cement produced from this plant will be Chhattisgarh, Madhya Pradesh, Uttar Pradesh (Central region), Jharkhand and Bihar. The target market has been identified based on most likely distance that the plant will cater to and location of other supplying clusters.

d. Forecast:

In India the cement consumption during 2010-11 was 165.63 million tonnes against 158.25 million tonnes during 2009-10 registering a growth of 4.7%. Region wise growth in demand is as follows:

Region	Cement consumption		
	2010-11	2009-10	Growth (%)
South	50.86	52.66	-3.4
West	31.35	28.07	+ 11.7
East	28.54	25.87	+ 10.3
North	27.50	26.68	+ 3.1
Central	27.38	24.97	+ 9.7
Total	165.63	158.25	+ 4.7

An analysis of growth in demand region wise indicate that the Western region and Eastern region continued with a double digit growth at 11.7% and 10.3% respectively; the North registered a growth of 3% and the Central 9.7% while in the South there was a negative growth of 3.4%. The negative growth in the South was primarily due to the fall in demand in Andhra Pradesh by 17% and a nil growth in Kerala while Tamil Nadu and Karnataka registered a growth of only 4%.

Markets:

The target market for NVCL's plant at Sonadih, Chhattisgarh is envisaged to be states of Eastern India. The market has been identified based on most likely distance.

From a level of around 48 mt in FY 14, cement demand in the target region is likely to reach around 82 mt in FY 20 growing at a CAGR of ~9 % pa.

Current market share of NVCL in East India market is between 15 – 17%. NVCL has a very strong presence and brand equity in this market. Thus NVCL should be able to maintain its market share and sell its entire cement produced in the future also

Infrastructure:

Road:

Infrastructure facilities like road transport post & telegraph communication, banking and medical facilities etc. will be improved and economic development would be **catalysed.**

The employment from existing mines will be continue for uneducated and unskilled workers. The existing cement plant will result in number of benefits and will continue the jobs directly /indirectly of the surrounding villagers. It will also continue opportunities for business and other activities like groceries, farm & agricultural products etc., thus resulting in gross economic up-liftment.

The project authorities will continue medical facilities in the form of dispensary / hospital in the plant area for their employees. These facilities will also be continue to be available to local population in emergencies. This along with rural welfare schemes have a positive health care impact

With increase in population and industrial activity, public transport will be more frequent, thereby having a positive impact resulting in improvement of communication facilities. Besides transport, communication facility such as phone etc. will also be continuing made available resulting in positive impact.

Power:

Required power for the cement plant as well as mines is obtained from Central Power Distribution Corporation Limited.

Labour Supply & Skill: Adequate skilled labour is available in the region.

7.0 Other Modifying Factors:

At present no national parks, historical monuments exist in the proximity of proposed mining lease area and no tribal issues are foreseen. The applied ML area of 64.815 Ha comprises of forest land (bade jhad ka jungle). No mining activities will be carried out before grant of Mining Lease and before land acquisition.

NVCL will implement the statutory and legal obligations and special conditions imposed, if any, by the following statutory agencies:

a) During grant and execution of lease deed by Directorate of Mines and Geology, Govt. of Chhattisgarh

b) Directives issued by Indian Bureau of Mines

c) Directives issued by Directorate General of Mines Safety

d) Conditions imposed by Ministry of Environment and Forests

e) State or Central Pollution Control Board

f) Any other statutory organization describing the nature of conditions and compliance position thereof.

The mine will be working systematically and scientifically since decades in profit and it has never faced any major problem which might have affected the mining project and put it at any kind of risk. Therefore, looking for the past history for the mining project for such a longer period no assessment of risk at the moment or in near future is considered necessary.

Statutory Provisions Relating to-

Labour: All applicable Labour Laws are inforced and will be implemented. The labourers will be getting all benefit as per Provisions of Mines Rule 1956, ID Act 1980, Contract Labour (Reg & Abolition) Act, Bonus Act, Maternity Benefit Act, Payment of Wage Act, Minimum Wage Act, persons (labourers) will be employed strictly as per the provisions of the prevailing Labour Laws and Rules there under.

Land: Almost the lease area belongs to Private land and some part is belongs to Govt. land. The compensation and other statutory formalities will be complied as per norm of the State Govt. that the plant will cater to, location of other supplying clusters and existing dispatches of the NVCL plant.

Cement Demand:

The estimated future growth rates for different markets, in the next

Market	Future CAGR (%)
Assam	10.4%
Bihar	11.6%
Jharkhand	6.4%
Orissa	8.1%
West Bengal	8.7%
Chhattisgarh	6.3%
Other North East states	10.3%

The Table shows the trend of future demand in different markets of the target region.

Year	Figures in million tonnes				
	FY 16	FY 17	FY 18	FY 19	FY 20
Assam	4.87	5.36	5.89	6.48	7.13
Bihar	12.37	13.73	15.24	16.92	18.78
Jharkhand	4.53	4.90	5.29	5.71	6.17
Orissa	10.25	11.27	12.40	13.64	15.01
West Bengal	15.11	16.47	17.95	19.56	21.32
Chhattisgarh	5.88	6.29	6.74	7.21	7.71
Other North East states	3.64	4.01	4.41	4.85	5.33
Total	56.66	62.03	67.92	74.37	81.45

Mining: Mining will be done strictly as per the approved Mining Plan/ Scheme of Mining as applicable and the provisions of all Acts, Rules and regulations made there under and the same practice will be followed.

Taxation: Taxes and cess as applicable will be paid as per the laws

Environmental Management

NVCL's commitment with special emphasis on the protection of environment is given below:

Air Quality

Wet drilling to suppress the dust emission from the drill machines at its source by inbuilt water injection system

Fixed continuous water spraying system on the haul road from working pit to the crushing plant

Automised water spray system at Limestone hoppers

Regular water sprinkling on blasted heaps and haul roads with water tankers. Use of sharp drill bits for drilling holes and arrangements for bit regrinding. Charging the holes by using optimum charge and using time delay detonator. Avoiding blasting during high windy periods, night times and temperature inversion periods.

Regular grading of haul roads and service roads to clear accumulation of loose material.

Excavation operations are suspended during periods of very strong winds.
Avoiding over filling of dumpers and consequent spillage on the roads

The vehicles and machinery are kept in well-maintained condition so that emissions are minimized.

Afforestation for control of dust. To arrest the amount of airborne dust, extensive plantation will be carried out within the mines and outside the mining lease. Plantation

of wide leaf trees, creepers, tall grass along approach roads, and on safety barrier zones will help suppress dust.

Road berms and dumps will be turfed and planted.

Operator cabins in all items of major HEMM equipment will be enclosed, to minimize dust exposure of the operators.

Noise Levels

The following noise abatement measurements will be adopted:

Proper and regular maintenance of vehicles, machinery and other equipment.

Carrying out blasting only during day time and not on cloudy days

Limiting time exposure of workers to excessive noise.

The noise generated by the machinery to be reduced by proper lubrication of the machinery and equipment.

The workers employed will be provided with protection equipment, earmuffs and ear-plugs, as a protection from the high noise level generated at the plant site wherever required.

Noise levels are also controlled by using optimum explosive charge, proper delay detonators and proper stemming to prevent blow out of holes. Proper and timely maintenance of mining machinery

Speed of trucks entering or leaving the mine will be limited to moderate speed of 25 kmph to prevent undue noise from empty trucks

Water Pollution Control Measures

Mining activities may cause adverse impacts due to mine drainage, siltation due to storm water and contaminated water from workshops and domestic sewage water. In order to mitigate the likely impacts the following management has been proposed.

Storm Water Management

Apart from construction of the bund, a garland drain will be provided outside the bund to stop water from entering into the mine. A check dam is proposed at the end of the drain for trapping the silt. The water overflow from the check dam will drain to Shivnath river through the existing seasonal nalla.

A garland drain surrounding the temporary dump area with sedimentation pits will be provided. The silt free water will be discharged to the natural drainage pattern.

Waste Water Management

Open cast mining of the limestone will not generate any waste water. As there is no mineral processing, no waste water will be generated. However, small quantities of domestic waste water will be released from the mines site.

At the workshop area, an oil separation tank will be used to segregate oil & grease from the outlet water of service ramp. Only clean water will be let out after skimming the oil and grease. This treated water will be used for plantation purpose.

Proposed Afforestation

Extensive plantation will be carried out at the following locations:

7.5m wide greenbelt all along the mine lease area.

Each side of the proposed haul road and road leading to crusher

Occupational Health and Safety

NVCL has established its own well equipped occupational health center at the site. All the employees in the mine undergo periodical medical examination.

NVCL has also attained the Occupational Health & Safety assessment system 18001 certification. All the mining operations are and will continue to be carried out strictly in accordance with the Mines Act, Rules & regulations. These practices will continue at the new mines also.

8.0 Classification:

The subject area is fall under "Stratiform, Stratabound and Tabular Deposit of Regular Habit" as per UNFC classification and suitable for working with opencast method of mining. Preliminary mine design / conceptual plan may be prepared after obtaining all necessary approvals from statutory authorities for working of mine.

Since, NVCL is operating existing mine adjoin to recommended ML area and has obtained all necessary permits it is expected that permits for recommended ML area will be obtained within a reasonable time frame after grant of Mining Lease.

Considering the above study Reserve at recommended ML area can be classified under 121 and 122 category of UNFC.

After the pre-feasibility study and economic axis study the limestone has been categorized as per the norm of UNFC is as under:

	Classification	Code	Quantity (tonnes)	Geological Grade
A. Mineral Reserve	(1) Proved Mineral Reserve	111	---	--
	(2) Probable Mineral Reserve	121	14717362	+38% CaO
	(3) Probable Mineral Reserve	122	5307525	+38% CaO
B. Remaining Resources	(1) Feasibility Mineral Resources	211	---	
	(2) Prefeasibility Mineral Resources (due to blocked out)	221	5306513	+38% CaO
	(2) Prefeasibility Mineral Resources (sub-grade)	221	2136375	34-38% CaO
	(3) Prefeasibility Mineral Resources (due to blocked out)	222	1604813	+38% CaO
	(3) Prefeasibility Mineral Resources (sub-grade)	222	605138	34-38% CaO
	(4) Measured Mineral Resources	331	---	--
	(5) Indicated Mineral Resources	332	---	--
	(6) Inferred Mineral Resources	333	---	--

	(7) Reconnaissance Mineral Resources	**334**	**---**	**--**
	Total Mineral Resources (A+B)		**29677726**	**--**

The mineable reserves of limestone is 147,17,362 + 53,07,525 = 200,24,887 tonnes (say 20.02 million tonnes) and proposed maximum production rate is about 10 lakh tonnes per annum.

9.0 Conclusion:

a. The deposit has been explored in a square grid of 150 m and reserve has been established under proven category.

b. The mine will be captive mine and catering to the need of limestone to plant for manufacturing cement in a constant basis since inception. For raising the limestone

from captive quarry in a systematic manner an approved mining plan, subsequently review through schemes has been in place.

c. The reserve established is meeting the threshold of manufacturing the cement as prescribed under NCCBM Norms.

d. On the basis of the detailed exploration (G-1) done over the entire lease area, Mining Plan has been prepared, having enough experience specific and end use grade of reserves and specific knowledge of forest/non-forest and other land use data, the economic viability of the mining project has been proved beyond doubt and thus the mineable part of the mineral resources which fall under the Ultimate Pit Limit (UPL) and is above the threshold value and above as bifurcated correspond to the Economic Axis (E-1) and the remaining resources as bifurcated above falling outside UPL that is falling within the statutory barrier correspond to the Economic Axis (E-2).

e. This project required investment of about 22.70 crore and the NPV will be about 4512072009/-, IRR about 206% and payback period will be about 2 years per the Pre-Feasibility Study done, cost of limestone production will be 250/-which is comparable being incurred by existing cement plants in the region which are operating probability in the region. The operating the mining lease is economical viable.

f. Thus, considering the entire above points as per the Guideline issued by Govt. of India, Ministry of Mines, Indian Bureau of Mines, the Feasibility Axis is comes Considered as E-1.

Nitesh Raghuvanshi

Nuvoco Vistas Corporation Limited

Rajesh Singh

Nuvoco Vistas Corporation Limited