Pre-Feasibility report
Banduhurang open cast mine augmentation

1.0 Executive Summary

Uranium Corporation of India Limited (UCIL), a Government of India undertaking under the Department of Atomic Energy (DAE) is engaged in mining and processing of Uranium ore. Banduhurang Open Cast Mine is operated by UCIL. It is located in East Singhbhum District of Jharkhand. Besides Banduhurang Mine, UCIL also operates Bagjata, Jaduguda, Bhatin, Narwapahar, Turamdih and Mohuldih Mines and Ore Processing Plants at Jaduguda and Turamdih in the region. The sanctioned capacity of Banduhurang open cast mine is 1.05 million for which the Ministry of Environmental & Forest has accorded environmental clearance vide letter No J-11015/961/2007-IA.II (M) dated 13.05.2008. The proposal is for enhancement of ore production capacity from 1.05 MTPA to 1.5 MTPA without increasing of mining lease area. The salient features of the project include:

Proposal	Augmentation of production capacity of Banduhurang Open Cast Mines from 1.05 million TPA to 1.50 million TPA
Location of Project	Banduhurang, Keruyadungri and Talsa in East Singhbhum District of Jharkhand
Latitude	22°43’45” N to 22°43’15”
Longitude	86°09’45” E to 86°11’30” E
Land Ownership of Lease Area	ML: 278.153 ha under Banduhurang, Keruyadungri and Talsa villages in East Singhbhum District of Jharkhand. No increase in ML area.
Method of Work	Open Cast Mining
Mineral Reserve	15 million Tones
Production capacity	Present : 1.05 million TPA, Proposed : 1.5 million TPA
Waste Generation	20 million tones
Waste disposal	Waste dump yard within mining lease
Mineral Transport	By trucks to Turamdih Processing Plant and proposed new ore processing facility nearby the mine
Mineral Processing	At Turamdih and proposed new ore processing facility nearby the mine. Uranium will be extracted as uranium peroxide/ MDU by a hydro-metallurgical process. The product will be dispatched to Nuclear Fuel Complex Hyderabad for further processing.

Working Regime	3 shifts per day; 300 working days per year.
Life of Mine	8 years w.e.f. 09.10.2020
Peak Water Demand	Present: 360 m^3/day which will be increased to 400 m^3/day. Out of total, fresh water demand will increase from 17.2 m^3/day to 27.2 m^3/day.
Source of water	Industrial: Treated Mine discharge Potable: Existing water supply system of UCIL from Kharkhai River a tributary of Subarnarekha River.
Power Demand	Present demand of 400 kW will increase to 650 kW
Source of power	Jharkhand State Electricity Board's Ichra Sub-station
Man Power	Present : 350 , Porposed : 450
Explosive Consumption	Present demand of 6 tpd will increase to 8.5 tpd
Fuel Consumption	Present demand of 6 tpd will increase to 9.0 tpd
Infrastructure	Arch Room, Workshop, Office Building and strengthening of road which will be sufficient for the proposed augmentation.
Proposed Investment	100 crore
Production Cost	Classified information
CSR Budget	2% of net profit

2.0 INTRODUCTION OF PROJECT/BACKGROUND INFORMATION

2.1 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

Banduhurang mine is open cast uranium mine located in Dhalbhum subdivision of East Singhbhum district of Jharkhand state at an aerial distance of about 5 km south of Tatanagar railway station on Howrah-Mumbai line. The deposit is covered under Survey of India toposheet no. 73 J/2 bounded between latitudes 22°43'45" N to 22°43'15" N and longitudes 86°09'45" E to 86°11'30" E. A metal road links the deposit to the adjacent Turamdih Uranium Mine, which is well connected by all metal roads with Jamshedpur and Jaduguda. Location of deposit is shown in Figure 1 . The mine is owned and operated by Uranium Corporation of India Limited (UCIL), Govt. of India Undertaking under the Department of Atomic Energy. UCIL's existing mining operations are spread over Jharkhand and Andhra Pradesh. UCIL is operating six underground mines (Jaduguda, Bhatin, Bagjata, Turamdih, and Mohuldih in Jharkhand and Tummalapalle in Andhra Pradesh) and one open cast mine (Banduhurang in Jharkhand). UCIL also operates uranium ore processing plants at Jaduguda and Turamdih in Jharkhand and Tummalapalle in Andhra Pradesh to extract the uranium

oxide. The uranium ore is extracted as "Yellow Cake" which is dispatched to Nuclear Fuel Complex, Hyderabad for further processing.

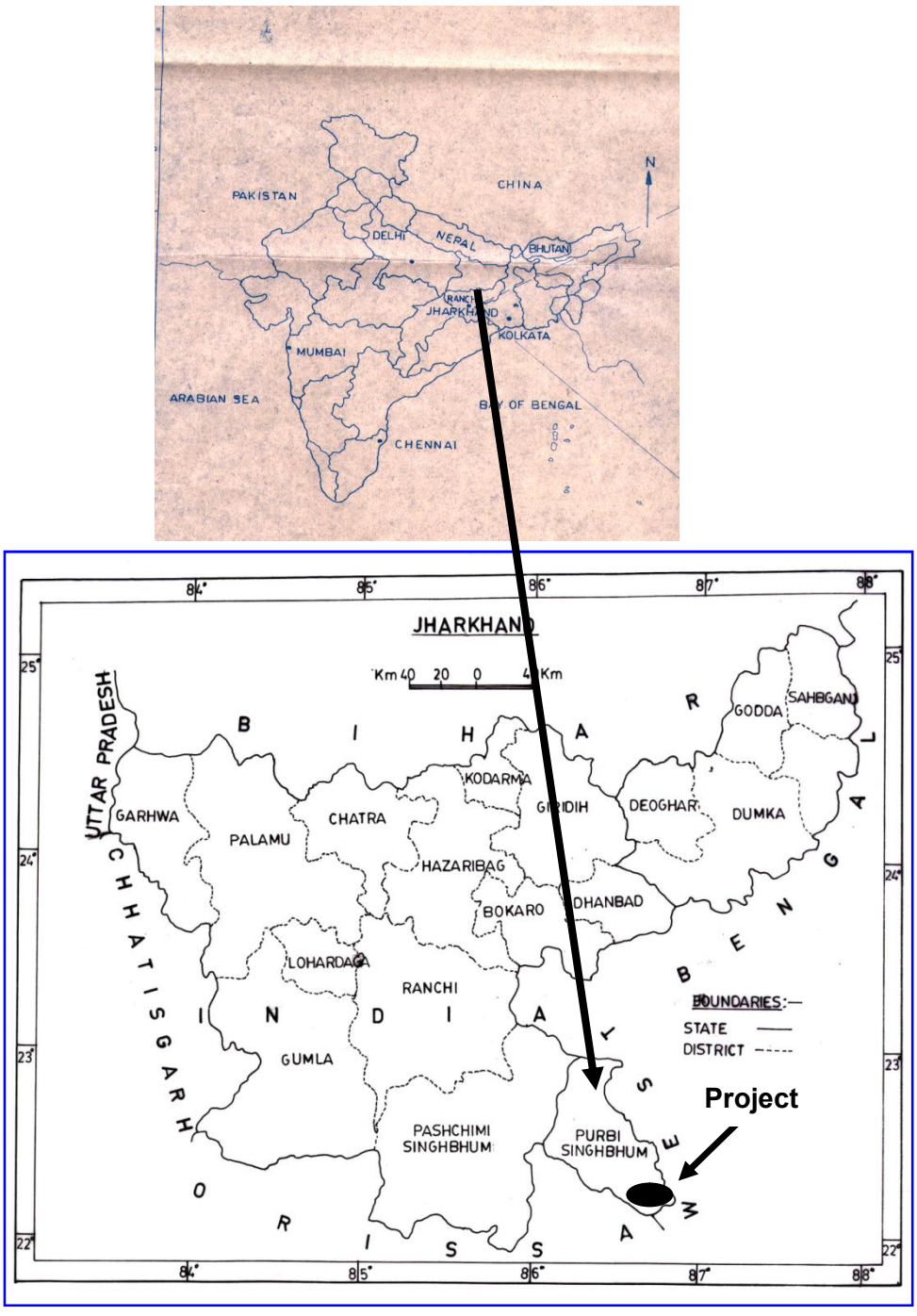

Figure 1: Location of Area

2.2 BRIEF INFORMATION OF THE PROJECT:

2.3 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY OR REGION:

Govt. of India has planned to increase nuclear power generation upto 20,000 MWe by the year 2020. This will lead to increased demand for Uranium. In order to meet the increased demand for uranium, UCIL has planned to increase the production from its existing mines besides developing new mines. Expansion of Banduhurang Mine is part of this programme to meet the increasing demand for uranium for India's nuclear power industry. India's uranium resources are scarce, only about 0.8% of the world's uranium deposits. However India contains 20 – 25% of the world's thorium deposits. India is developing the technology to utilise thorium in its nuclear power programme in a three stage programme. The first two stages require uranium. India has to exploit the existing uranium deposits. The proposed expansion programme will increase the availability of nuclear fuel for the 1st two stages of the country's nuclear power programme. The proposed expansion project will also generate indirect employment for local inhabitants in a predominantly tribal area. UCIL will spend part of the profits from the expanded mine for peripheral development which will benefit local villagers.

2.4 DEMAND AND SUPPLY GAP:

Demand of fuel for nuclear reactor is not fully met by indigenous uranium. At present total 6780 MWe of installed nuclear power capacity, about 32% of fuel requirement is met by imported uranium. With addition of more nuclear power reactors, demand and supply gap of uranium is likely to increase.

2.5 IMPORT VS INDIGENOUS PRODUCTION:

Refer clause 2.4 above.

2.6 EXPORT POSSIBILITIES:

There is no possibility of any export of uranium ore or concentrate from India.

2.7 DOMESTIC / EXPORT MARKET:

There is no possibility of domestic and export market for uranium ore supply

2.8 EMPLOYMENT GENERATION:

The mine has employed 350 persons which will be increased to 450 persons for augmentation programe.

3.0 PROJECT DESCRIPTION

3.1 TYPE OF PROJECT INCLUDING INTERLINKED AND INTER-DEPENDENT PROJECT

The present project envisages capacity increase of an existing open cast mine project without increase in mine lease area. The ore from Banduhurang open cast mines is transported by road to the nearby Turamdih Ore Processing Plant. The haulage distance is about 3 km. Turamdih Ore Processing Plant processes the ore from Banduhurang open cast mine, Turamdih, Mines and Mohuldih mines. The additional quantity will be processed in the proposed processing plant nearby the mine for which separate application for environmental clearance will be made.

3.2 LOCATION:

Banduhurang mine is open cast uranium mine located in Dhalbhum subdivision of East Singhbhum district of Jharkhand state at an aerial distance of about 5 km south of Tatanagar railway station on Howrah-Mumbai line. The deposit is covered under Survey of India toposheet no. 73 J/2 bounded between latitudes 22°43’45” N to 22°43’15” N and longitudes 86°09’45” E to 86°11’30”E.

3.3 DETAILS OF ALTERNATE SITE:

Since the project envisages capacity increase of an existing open cast mine and mining is a site specific activity guided by deposit geology, the question of any alternate site does not arise.

3.4 SIZE AND MAGNITUDE OF OPERATION:

The mine lease is spread over 278.153 ha (686.86 acres). The present capacity of mine is 1.05 million TPA of ROM ore. The present proposal envisages increasing the ROM production from 1.05 million TPA to 1.50 million TPA without increasing the mine lease area.

3.5 MINE DESCRIPTION

3.5.1 Geology:

A. REGIONAL GEOLOGY

The Geology of this region confined to the Geological deposition offered by Singhbhum Thrust Belt (STB) which is well known for the Copper-Uranium mineralisation. The Uranium in the Thrust zone occurs in areas that have been extensively affected by chloritization, biolitization, sericutization and feldspathetization with the introduction of such minerals as tourmaline, apatite, allanite, xenotime and fluorite.

Localization of mineralisation appears to have been controlled predominantly by small-scale structures. Ore mineralisation is generally confined to the lower part of the Chaibasa formation.

Uranium occurs primarily in uraninite, which has three textural forms resulting from at least three episodes of mineralisation. The uranium was originally derived by erosion of the Singhbhum granite, which placed uranium in the Chaibasa sediments of the Singhbhum Group. Most of the deposition was in the form of detrital uraninite in conglomerates at the base of the section. The sedimentary uranium was then remobilized during deformation and locally enriched along the thrust zone.

B. LOCAL GEOLOGY

The present area is a part of the Turamdih west (Banduhurang); which is persistent horizon of chlorite schists, stretching in the west-north-west direction upto Rajgaon, 10 kms away and to 13 kms from Narwapahar to the east. This horizon of chlorite schists is bounded on the South by an arkosic rock. This boundary between the chlorite rocks and the feldspathic arkose is often marked by impersistent band of talcose sericite schist and quartzite.

Northern boundary is covered with thick layer of soil; the width of chloritic rock at Banduhurang deposit is 1.0 to 1.2 Km attaining a thickness of 150-200m. Feldspathic schist is more frequest and prominent on the western part of the deposit and the talcose sericite schists sandwiched between the feldspathic arkose/schist and chlorite schist has been encountered in most of the bore holes drilled in the areas has been considered as a guide to demarcate the end of mineralisation at the bottom.

Uranium mineralisation is confined within chlorite and feldspathic chlorite schist while the sericite-quartz schist is devoid of any radioactivity and appear to act as a footwall marker horizon of uranium mineralisation.

3.5.2 Mineral Reserves:

Reporting of reserves and grade of any uranium deposit of our country are considered to be classified information as per Atomic Energy Act 1962 (33 of 1962). Accordingly, the same cannot be divulged. However, it has been envisaged that the estimated mineral reserves are sufficient to meet the proposed level of ROM ore production of 5000 tones per day for a period of about 08 years w.e.f. 09.10.2020. As per United Nations Framework of Classification the reserve of Banduhurang is under 111 categories.

3.5.3 Mining:

- **Open Cast mining**

  The mining shall be done by open cast mining method. The mining method involves 6 meter high ore bench and 12 meter overburden/waste benches, breaking the rock by blasting using explosives, breaking of oversize boulder by rock breaker and crusher, loading the material with help of excavator and hauling with dumpers. Mining will be carried out by excavator and dumper combination primarily by the top slicing method as is being practiced. After initial dumping of waste at external dump, back filling of mined out void at western pit will be carried out with excavated waste from eastern pit.

- **Mining parameters**

Ore Benches:	6 m height & 40 m working width
Overburden/Waste Benches:	6 m height & 40 m working width in the vicinity of ore and 12 m height, 50 m working width in other cases
Bank Slope Angle:	80 degree
Gradient of Haul Road:	1 in 16
Ultimate Pit Slope:	44 degree when depth of pit >120m, 47 degree when depth of pit <120m
Ultimate Berm Width:	8 m in each bench

- **Major Mining Equipment for Open Cast Mining**

Drilling Machine:	03
Dumpers/Tippers:	10
Hydraulic Shovel:	03
Bull Dozer:	02
Rock Breaker:	02
Motor Grader:	01

3.5.6 Mineral Transport

At present mineral is transported to the adjacent ore processing plant at Turamdih. The additional ore @ 1500 tpd will be transported to the new proposed ore processing plant nearby the mine.

3.5.7 Life of the Project

The life of the project is 08 years w.e.f 09.10.2020.

3.6 Raw Materials

The mine shall consume 8.5 tpd of explosives. Explosives will be kept in the existing magazine of 20 t capacity. The mine shall consume 9.0 tpd HSD. The HSD will be stored in a 35 kl tank.

3.7 Resource Optimization / Recycling and Resource

The project will require 372.8 m^3/day of industrial water which will be met by utilizing mine discharge water and recycling effluents generated from various operations.

3.8 Availability of Water, Energy / Power its source and requirement

a) Water :

At Banduhurang mine, water is required for drilling, dust suppression on haul roads, equipment washing and land reclamation purposes. At present the total requirement of such industrial water is 342.8 m^3/day. Besides, about 17.2 m^3/day water is used for drinking water and pit-head bath. Water demand after augmentation will be about 400 m^3/day including 27.2 m^3/day for drinking and pit head bath. The drinking water and water required for the pit head bath is drawn from existing drinking water network at Turamdih. For industrial water, the water recovered from de-watering of adjacent Turamdih mine and harvesting rain water. Water pumped out of the mine pit and surface run-offs from waste dump area is first sent to a desilting tank. Clear water from the desilting tank is treated in a mine water treatment plant. The water thus treated is used to meet the industrial water requirements of Banduhurang Mine as well as the Uranium Ore Processing Plant at Turamdih. In addition surface water run-offs during the monsoon season will be collected by a network of drains and stored for meeting industrial water requirements of Banduhurang Mine.

b) <u>Power</u>

Maximum power demand for the expanded project has been estimated to be 0.65 MVA. The power supply is received at 6.6 kV from the MRS at Turamdih through two single circuit overhead lines one from normal bus and the other from emergency bus.

3.9 WASTES

The waste produced in the course of removal of overburden and production of ore shall be dumped in the designated dumping ground close to the pit at a distance of 5.0 KM from the quarry face. The height of the dump shall be 45 m in three layers 20 m thickness in bottom, 15 m thickness in middle and 10 m thickness at the top.

The external OB dump will cover about 69 ha in the southern part of the lease area. There will be 3 lifts. The first lift will have a maximum height of 20 m, whereas the 2nd lift will be 15 m high and third lift of 10 m height. During the course of mine life of 8 years, 20 million tons (MT) of OB / waste is expected to be generated. Out of 20 MT waste, 5 MT will be dumped in external dump yard. The rest quantity of waste i.e. 15 MT will be dumped in central pit as concurrent backfill in the exhausted western part of the quarry. As the project will be commissioned after 3 years, total waste to be removed at the span of 11 years is 25 MT. A safe distance of more than 75 m will be kept between the active mine face at the eastern part of pit and backfill dump edge. The top level of backfill dump at ultimate stage will be 203 mRL. After this stage the dump top will be terraced and trees planted on dump top. All dumps will be stabilized by terracing the slopes and reclaimed.

4.0 SITE ANALYSIS

4.1 CONNECTIVITY

The nearest railway station is Tatanagar Rly Station which is about 6 Km from the site. North of the site is connected to Tatanagar-Hata- Chaibasa Road. The nearest functional airport is Sonari at Jamshedpur which is about 12 km from the site. Ranchi Airport is about 150 km by road from the project site.

4.2 LAND FORM, LAND USE, OWNERSHIP

Present mode of utilisation of land in the proposed lease area is given in Table as under.

Table: Land use in lease area

Land Use Category	Existing
Quarry & waste Dumps	106.080
Top soil dump/ ore dump	10.293
Forest land	28.959
Plantation / GB	35.500
Desilting cum Rainwater harvesting pond	4.000
Surface Water Bodies	5.235
Settlements / Buildings	1.806
Roads & Other infrastructure	7.868
Open land	78.412
TOTAL	**278.153**

4.3 TOPOGRAPHY

The region is marked with three numbers of prominent ridges with east-west to NW-SE trend at Talsa Pahar, Nandup and Banduhurang. Banduhurang ridge extends for 2.5 km with a lateral extension of about 1 km. The highest level of the ridge has been recorded at 228 mRL with steep slopes along northern and southern flanks. The ridge confluences the general ground level of the surrounding area at 148 mRL in the north and 166 mRL in the south. The ridge has been marked with 3 nos. of protrusion occurring along the axis of the ridge with maximum elevations of 226 mRL, 228 mRL and 207 mRL in the eastern, central and western part respectively. In addition to these, one small undulated hillock with top RL of 184 m to 186 m is prominent at the north-eastern corner of the ridge.

Major part of the area has dendritic drainage pattern. The drainage of the area is controlled through a network of small streamlets with a general northward flow direction ultimately draining into Kharkai River. Most of these streamlets are of seasonal nature. The proposed core zone, which is a hill, is drained by a number of small drainage channels, which flow into small streams ultimately joining Kharkai River. The most prominent stream of the area originates from the western end of the Banduhurang ridge which flows northward into the Kharkai River located about 3 km north of the deposit. The Kharkai River is a perennial river and a major tributary of the Subarnarekha. It flows with a meandering course towards east and finally drains into the Subarnarekha river on the south-western fringes of Jamshedpur city near Kagalnagar. River Subarnarekha flows about 9.5 km north of the proposed lease area. Kharkai river flows in the western sector of the study circle and joins Subarnarekha river at 4 km north of study area buffer zone boundary.

4.4 LAND USE

Refer Clause 4.2 above

4.5 EXISTING INFRASTRUCTURE

Most of the infrastructure such as Mine Office, surface material handling system, electrical sub-station, stores, explosive magazine, workshop, weigh bridge, rest shelter, canteen, vocational training centre, medical unit, mine water pump house, desilting pond, wheel washing system etc. are already in place.

4.6 SOIL CLASSIFICATION

As per the District Planning Map of Purbi Singhbhum, published by National Atlas and Thematic Mapping Organisation, Kolkata the soil of the area where Banduhurang Mine is located is classified as “Red Loamy Soil”.

4.7 CLIMATE

The area lies in the tropical region where climate is characterized by very hot summer and cold winters. Summer is typically from mid March to mid June when temperature ranges from a maximum of 46^0C during day and a minimum of 11.6^0C at night. Winter is from December to February when the temperature during day goes up to 31.3 ^{0}C and minimum temperature at night becomes as low as 5^0C. The average annual rainfall as recorded at IMD observatory at Jamsedpur is 1391mm. The south-west monsoon lasts from mod-June to mid September and the area gets more than 80% of the annual rainfall during these four monsoon months.

4.8 SOCIAL INFRASTRUCTURE AVAILABLE:

The mine is located in a rural area. The nearest town / city Jamshedpur is about 5 km from the mine, which has all necessary social infrastructures.

5.0 PLANNING BRIEF:

5.1 PLANNING CONCEPT:

The entire infrastructure necessary for the expanded mine are already in place. All the machineries are also available. The higher production will be achieved by increasing machinery utilization. The rated capacity of the expanded mine 1.5 million TPA shall be attained after receipt of necessary statutory clearances.

5.2 LAND USE PLANNING:

5.3 ASSESSMENT OF INFRASTRUCTURE DEMAND

Most of the infrastructure such as Mine Office, surface material handling plant, electrical sub-station, stores, explosive magazine, workshop, weigh bridge, rest shelter, canteen, vocational training centre, medical unit etc. are already in place. Some of these such as surface material handling plant, explosive magazine and workshop will have to be expanded to cater to increased excavation and handling of ore.

5.4 AMENITIES / FACILITIES

All necessary amenities such as rest shelters, canteens, pit head baths, vocational training centre etc. already exist.

6.0 PROPOSED INFRASTRUCTURE:

Infrastructure facility shall be development for Arch Room, Office building, workshop, Strengthening of road etc.

7.0 REHABILITATION & RESETTLEMENT (R&R) PLAN:

Since the proposed expansion project does not envisage any leasing and / or acquisition of additional land no rehabilitation & resettlement is required for this project.

8.0 PROJECT SCHEDULE & COST ESTIMATE

8.1 LIKELY DATE OF START OF CONSTRUCTION AND LIKELY DATE OF COMPLETION:

Project is likely to be completed in three years i.e. by 10.10.2020.

8.2 ESTIMATED PROJECT COST ALONG AND ECONOMIC VIABILITY OF THE PROJECT

The expected project cost is Rs 100 crore.

9.0 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATION)

The proposed expansion project will have the following benefits:

- Improve supply of indigenous uranium ore and thereby increase supply of fuel for India's nuclear programme.
- Generate direct as well as indirect employment.
- Pave way for further peripheral development of a predominantly tribal area.

The expanded mine will not employ any additional persons. However indirect employment is likely to be generated on account of increased mineral transportation and ancillary services. Peripheral development by UCIL will benefit local villagers most of whom are tribal.