PRE-FEASIBILITY REPORT

1.1 Introduction:

MoP&NG, GOI, vide O.O F.No 12012/52/2003-ONG-II has approved Mining license for PBS-1-1Extn PML (85.83SKM) for a period of seven years. Gas is being produced commercially from Upper Cretaceous reservoirs by ONGC in Palk bay Shallow (PBS) field from the established reserve base of about 1.5 MMt (O+OEG) IIP.

1.2 Geological Setting of the Area:

PBS-1-1 Extn PML is in Ramnad sub-basin which is in the southern part of Cauvery Basin in offshore area. Ramnad sub-basin and its continuation into Palk Bay-Gulf of Mannar is bounded in the northwest by Pattukottai-Mannargudi ridge and in the southeast by Mandapam-Delft ridge. The sub basin holds sediments over 6000 m in thickness, ranging in age from Lower Cretaceous and older to Recent. The synrift sedimentary column comprises mainly of shale and sandstone in the Andimadam Formation. Sag phase sedimentation represented in the upper Cretaceous Bhuvanagiri, Kudavasal Shale, Nannilam and Portonovo shale is predominantly sand shale alternations with minor limestone development. Major part of the passive margin sequences ranging from Paleocene to Recent were deposited on the eastern shelf-slope regime with eastward prograding coast line. The siliciclastic sequences of the passive margin stage are interspersed with major limestone intervals corresponding to Eocene and Miocene periods.

Two regional fault trends - older NNE-SSW curvilinear fault set intersected by a younger EW fault set which are deep seated and Basement controlled play a vital role in the formation of the structures, subsequent charging and entrapment in Ramnad Sub basin. The established pools at upper Cretaceous reservoir levels are all located along or at the intersection of these two trends.

The hydrocarbon potential of Upper Cretaceous reservoirs ranging in age from Turonian to Campanian (Bhuvanagiri & Nannilam formations) is well established while the efforts to establish hydrocarbon prospectivity of Lower Cretaceous & older sequences are still at the nascent stage. About 55 exploratory & development wells were drilled in Ramanathapuram PML, out of which 29 are gas bearing in Nannilam, Bhuvanagiri and Lower Kamalapuram formations. The Lower Cretaceous being the source rocks, there is a fair chance of hydrocarbon accumulation in these sequences at favorable places.

1.3 Technical Justification for the locations:

Based on detailed G&G studies, about 6 exploratory locations have been identified in PBS-1-1 Extn PML area to test the prospectivity of Nannilam, Bhuvanagiri and Andimadam formations. Play maps prepared for different formations have clearly brought out the leads. The details of locations (tentative, to be firmed up) are given below.

No. of wells proposed to be drilled	Type/ Category	TD (M) Tentative	Objective
6	Exploratory/B	3000-4000	Nannilam, Bhuvanagiri & Andimadam

Six locations as mentioned above are planned to be drilled in the area demarcated by the following coordinates of PBS-1-1 Extn PML.

Table: 1 Sampling points and their co-ordinates.

Sl No.	Block name	Location	Well co-ordinates		Distance from coast line
			Latitude Deg Min Sec	Longitude Deg Min Sec	
1	**BLOCK III**	**Loc-1**	**9° 19’ 48.71”**	**79° 02’ 50.22”**	**2.05 KM**
2	**BLOCK III**	LOC-2	**9° 21’ 01.38”**	**79° 02’ 32.41”**	**3.45 KM**
3	**BLOCK III**	LOC-3	**9° 19’ 41.41”**	**79° 05’ 35.89”**	**2.35 KM**
4	**BLOCK III**	LOC-4	**9° 21’ 36.97”**	**79° 00’ 10.94”**	**1.54 KM**
5	**BLOCK III**	LOC-5	**9° 23’ 27.58”**	**78° 58’ 34.19”**	**1.85 KM**
6	**BLOCK III**	LOC-6	**9° 19’ 18.41”**	**79° 04’ 01.92”**	**3.10 KM**

BLOCK CO-ORDINATES OF -PBS-1-1 EXTN PML

	Latitude				Longitude			
Vertex	**Deg**	**Min**	**Sec**		**Deg**	**Min**	**Sec**	
R	9	23	35.37154	N	78	57	0.8929	E
S	9	23	35.3781	N	78	59	55.572	E
T	9	22	5.38431	N	78	59	55.575	E
U	9	22	5.39446	N	79	4	25.543	E
V	9	20	5.40274	N	79	4	25.547	E
W	9	20	5.41064	N	79	7	55.522	E

X	9	18	31.41713	N	79	7	55.526	E
D2	9	17	35.41873	N	79	6	55.535	E
R to D2 coastline								

1.4 Techno-economic justification for the locations:

Drilling of the proposed 6 locations are expected to accrete 15 MMt in this part of the basin.

1.4 Details of proposed Drilling Activity.

Ultra shallow jack up rig is proposed to be deployed to undertake drilling in the block.

The technical details of the proposed drilling activity are given below:

Well location / Depth	As per the enclosed list
Duration of drilling	3 - 4 months for each location (30-50 days for drilling and remaining for testing.
Qty. of drilling fluid	1200 m3 for each well
Qty. of cuttings	300 -400 m3 each well
Qty. drlg. Waste water	06-08 m3 each well
Location Detail	As per enclosed list
Distance of block boundary from coast line	Onland locations away from the coast line.
Development plan in case of strike	To be chalked out at the end of Appraisal programme
HC reserve (initial inplace)	The provisional Initial Inplace Reserves have been estimated for 30 MMt (O+OEG).
Formation pressure	Hydrostatic
Test flaring duration	2 to 3 days

2.1 Details of the drilling rig proposed to be deployed

Type of rig	Ultra shallow Jack up rig
Drilling mud composition	Water based Drilling Fluid
Power generator type & Nos.	AC-SCR type (06 Nos.)
Diesel consumption	6M^3/Day
Qty of fresh water requirement & Source	25 m^3 /Day Transported from nearby source through contractor
Manpower on rig	25 per shift of 12 hrs. Two shifts/day
Material requirement & Mobilization	From ONGC base Karaikal
Details of solids handling system on rig	Shale Shakers- 1200 GPM capacity Desander- 1200 GPM capacity Desilter- 1200 GPM capacity
Details of Sewage treatment, if any.	Not applicable

2.2. Drilling Operations

Only water based drilling mud will be used. The quantity of drill cuttings generated will be around 300-400 m3. The quantity of waste water produced will be about 15 m^3/day. The rig will be provided with solids handling system comprising Shale shakers (1200 GPM), Desander (1200 GPM) and degasser with vacuum pump.

Drilling operations will be carried out using an electrical type drilling unit for drilling of oil and gas wells consists of a derrick and the top of which is mounted a crown block and a hoisting block with a hook. From the swivel is suspended a Kelly stem passes through a square or hexagonal Kelly bush which fits into the rotary table. The rotary table receives the power to drive it from an electric motor. The electric motor rotates the rotary table which passes through the Kelly bush and the rotations are transmitted to the bit as the drilling progresses, the drill pipe in singles are added to continue the drilling process. At the end of the bit life, the drill pipes are pulled out in stands and stacked on the derrick platform. A stand normally has 3 single drill pipes. After changing the bit, the drill string is run back into the hole and further drilling is continued. This process continues till the target depth is reached.

During the course of drilling, cuttings are generated due to crushing action of the bit. These cuttings are removed by flushing the well with duplex/ triplex mud pumps. The mud from the pump discharge through the rotary hose connected to stationery part of the swivel, the drill string and bit nozzles. The mud coming out of the bit nozzles pushes the cuttings up hole and transports them to the surface through the annular space between the drill string and the hole. The mud not only carries away crushed rock from the bottom of the hole but it also cools the bit as it gets heated due to friction with formation while rotating. The mud also helps in balancing subsurface formation pressures and by forming a cake on the walls of the well, diminishes the possibility of crumbling or caving of the well bore.

At the surface, the mud coming out from well along with the cuttings falls in a trough and passes through the solids control equipment i.e. Shale shaker, de-sander and de-silter. These equipments remove the solids of different sizes which get mixed with the mud during the course of drilling. The cleaned mud flows back to the suction tanks to be again pumped into the well. The drilling mud/ fluid circulation is thus a continuous cyclic operation. The most suitable clay for mud preparation is bentonite which is capable of forming highly dispersed colloidal solutions. Various other chemicals are also used in mud preparation as per requirements dictated by the temperature/pressure conditions of the wells. The mud is continuously tested for its density, viscosity, yield point, water loss, PH value etc. to ensure that the drilling operations can be sustained without any down hole complications.

2.3 Drilling facilities

Drilling is a temporary activity which will continue for about 30-50 days for each well in the block. The rigs are self-contained for all routine jobs. Once the drilling operations are completed, and if sufficient indications of hydrocarbons are noticed while drilling, the well is tested by perforation in the production casing. This normally takes 5-7 days. If the well is found to be a successful hydrocarbon bearing structure, it is sealed off for future development.

2.4. General Requirements of Drilling

a. Drilling muds

Drilling of wells requires specially formulated muds which basically comprise in earth materials like bentonite, barite in water with several additives to give mud weight, fluidity and filter cake characteristics while drilling. The drilling muds have several functions like lubrication and cooling of the drill bit, balancing subsurface formation, bringing out the drill cuttings from the well bore, thixotropic property to hold cuttings during non-operations, formation of thin cake to prevent liquid loss along well bore etc.

Several additives are mixed into the mud system to give the required properties. Water based mud will be used to the possible extent in exploratory drilling but use of synthetic based mud may require due to complexities associated with the geological formation and associated hole stability problems.

b. Power Generation

The drilling process requires movement of drill bit through the draw works which require power. The power requirement of the drilling rig will be met by using the six Diesel Generator sets with a diesel consumption of about 6 Kl/ day. The exhaust stacks of the DG sets are likely to vent the emissions.

c. Water requirements

The water requirement in a drilling rig is mainly meant for preparation of drilling mud apart from washings and domestic use. While the former consumes the majority of water requirement, the water requirement for domestic and wash use is very less. The daily water consumption will be 25 $m^{3/}$d of which 21 $m^{3/}$d will be used for mud preparation, cutting washing, Desander, Desilter etc. And 4 $m^{3/}$d will be used for domestic purposes including drinking.

d. Domestic waste water

Domestic waste water shall be treated and disposed

e. Solids removal

The rock cuttings and fragments of shale, sand and silt associated with the return drilling fluid during well drilling will be separated using shale shakers and other solids removal equipment like desanders and desilters. The recovered mud will be reused while the rejected solids will be collected and disposed.

f. Drilling cuttings and waste residual muds

During drilling operations, approx. 300-400 m^3 per well of wet drill cuttings are expected to be generated from each well depending on the type of formation and depth of drilling. In addition to the cuttings 06-08 m^3/day of waste water is likely to be generated during well drilling. The waste residual muds and drill cuttings which contain clay, sand etc. will be disposed.

g. Testing

Testing facilities will be available at drilling rig for separation of liquid phase and burning of all hydrocarbon gas during testing. The test flare boom will be located at a safe distance from the drilling rig.

h. Chemical storage

The drilling rig will have normal storage facilities for fuel oil, required chemicals and the necessary tubulars and equipment. The storage places will be clearly marked with safe operating facilities and practices.

i. Manpower

The drilling rig will be operated by approx. 50 persons on the rig at any time. The manpower will operate in two shifts with continuous operations on the rig.

j. Logistics

Crew transfers to and from the drilling rig, materials, diesel and chemicals will be through offshore vessels

3. Investment anticipated

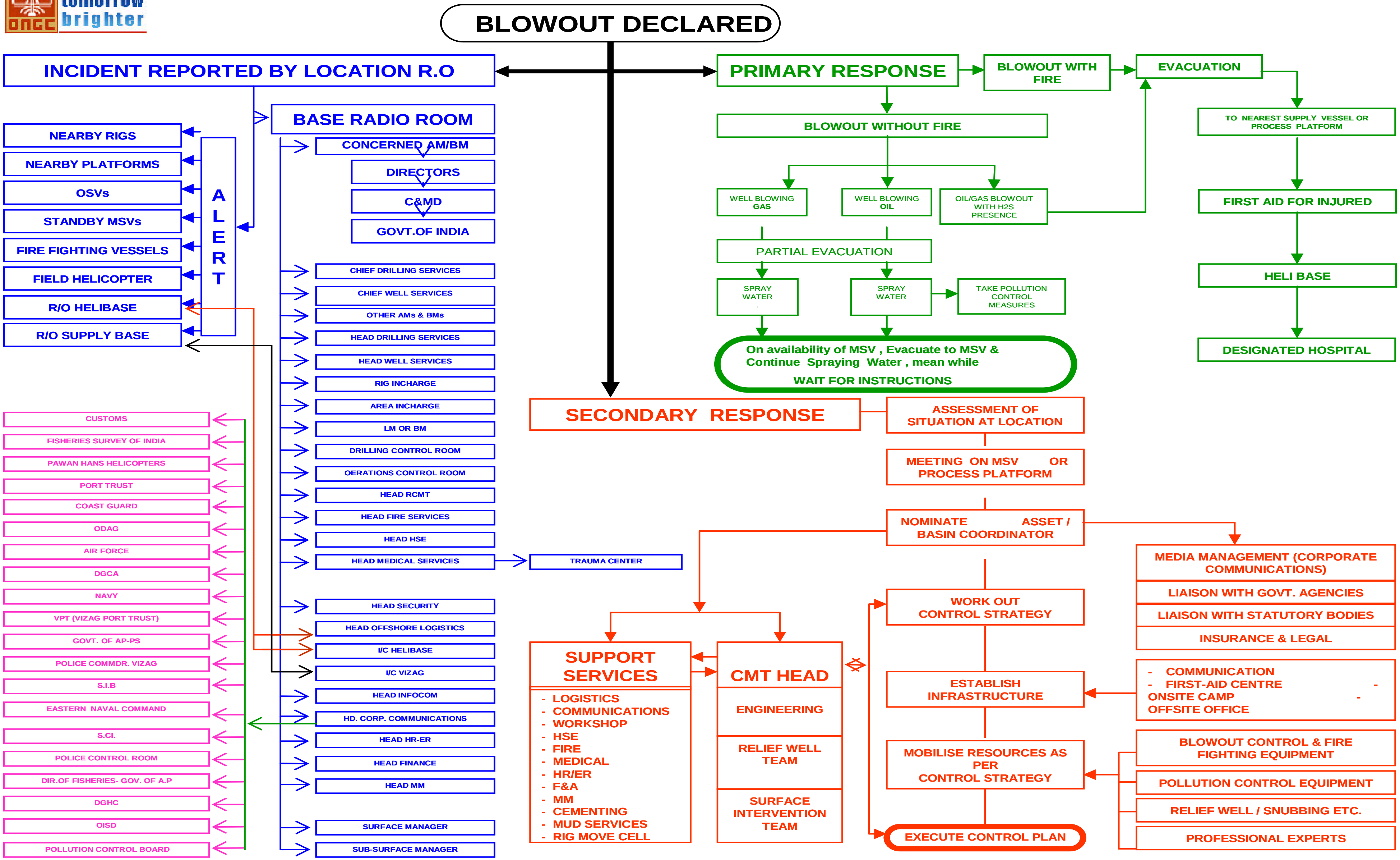
The anticipated cost of drilling of each well (which stacking of the location, land acquisition, site preparation and drilling activity works out to Rs.100.00 crores/well.

4. Justification for Environmental Clearance.

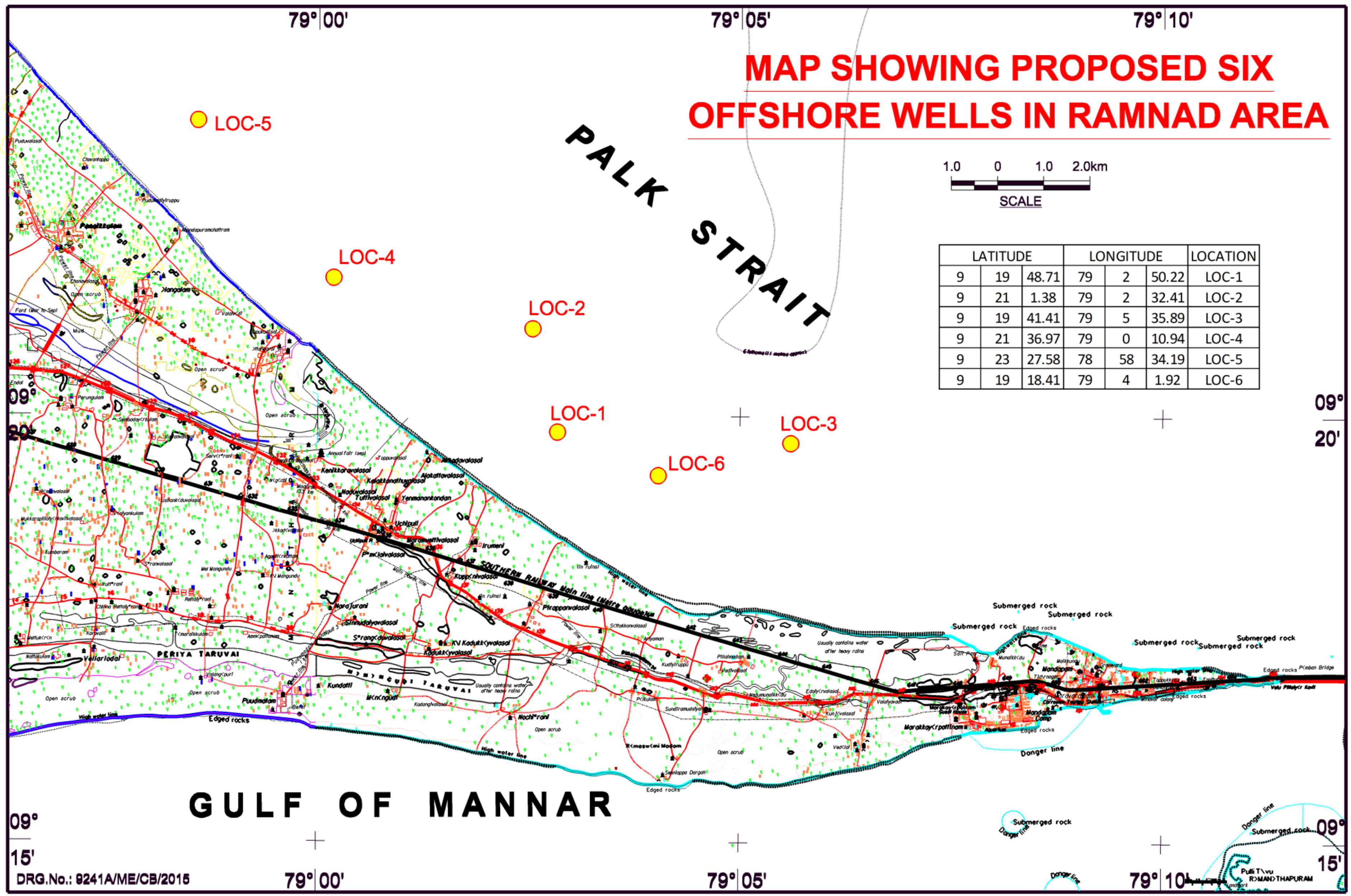
There are four yet to be proved areas which has potential of 15 MMt IIP and as such merit probing through drilling.

In view of the above, it is proposed to obtain the environmental clearance at the earliest. The map indicating the proposed locations (tentative-to be firmed up) is given in Fig. 1.

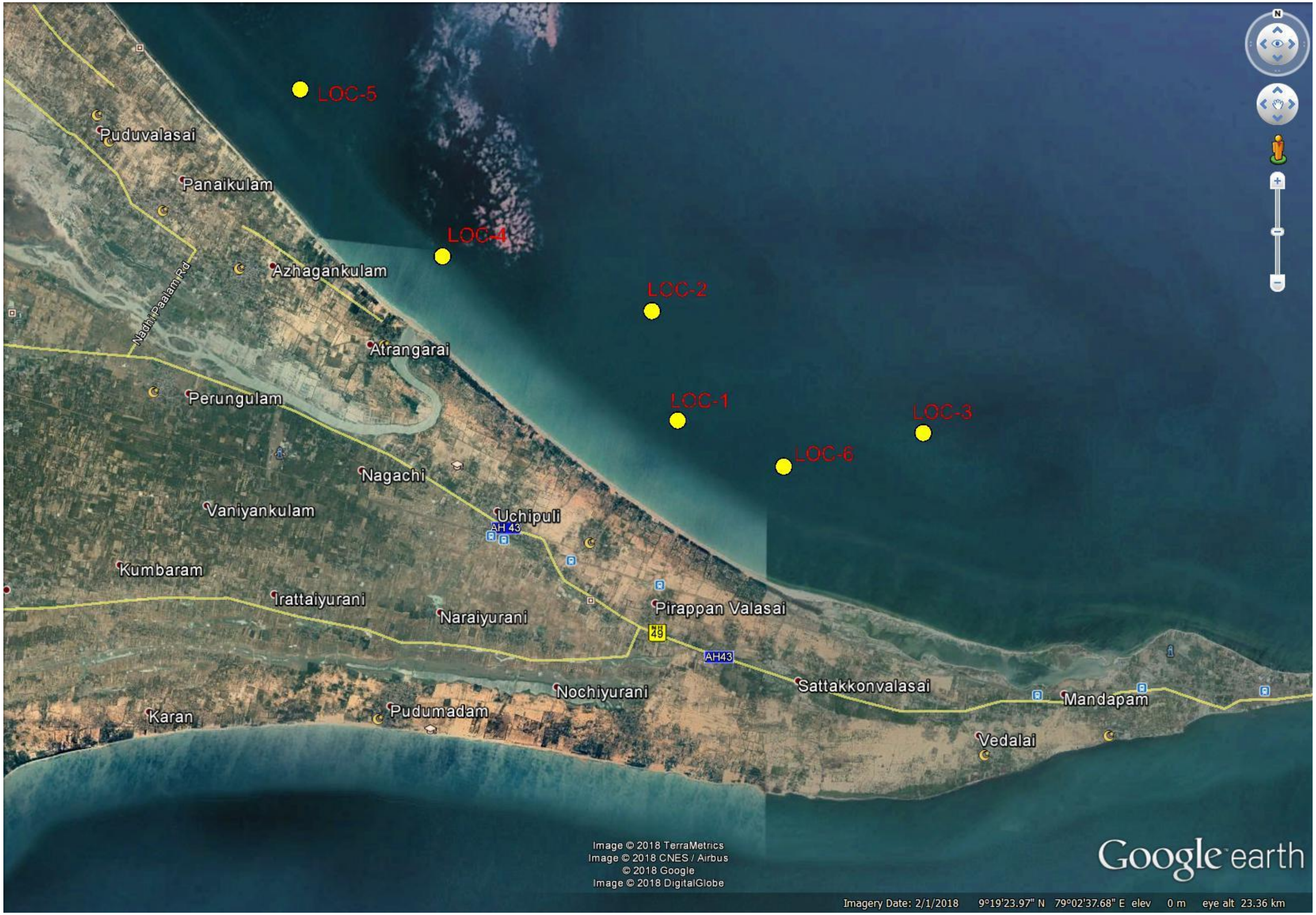
CONTINGENCY PLAN FOR OFFSHORE BLOWOUT(DRILLING RIG)



MAP SHOWING PROPOSED SIX OFFSHORE WELLS IN RAMNAD AREA



LATITUDE			LONGITUDE			LOCATION
9	19	48.71	79	2	50.22	LOC-1
9	21	1.38	79	2	32.41	LOC-2
9	19	41.41	79	5	35.89	LOC-3
9	21	36.97	79	0	10.94	LOC-4
9	23	27.58	78	58	34.19	LOC-5
9	19	18.41	79	4	1.92	LOC-6



PBS-1-1 Extn. PML superimposed on Google image showing six exploratory locations identified in Palk Bay shallow offshore area and the respective distance from coast