

**Proposal for UNFC G3 Level Exploration for Vanadium
and Titanium in Beach and Dune Sands of Talashil
Block in Sindhudurg District, Maharashtra.**

Direct Submission

To,

National Mineral Exploration Trust (NMET)

Ministry of Mines

F-114, Shastri Bhawan,

New Delhi-110001

By,



Geo Marine Solutions Pvt. Ltd., Mangalore

4-35/4(10), Sankaigudda, Bejai, Mangalore, Karnataka

February 2024

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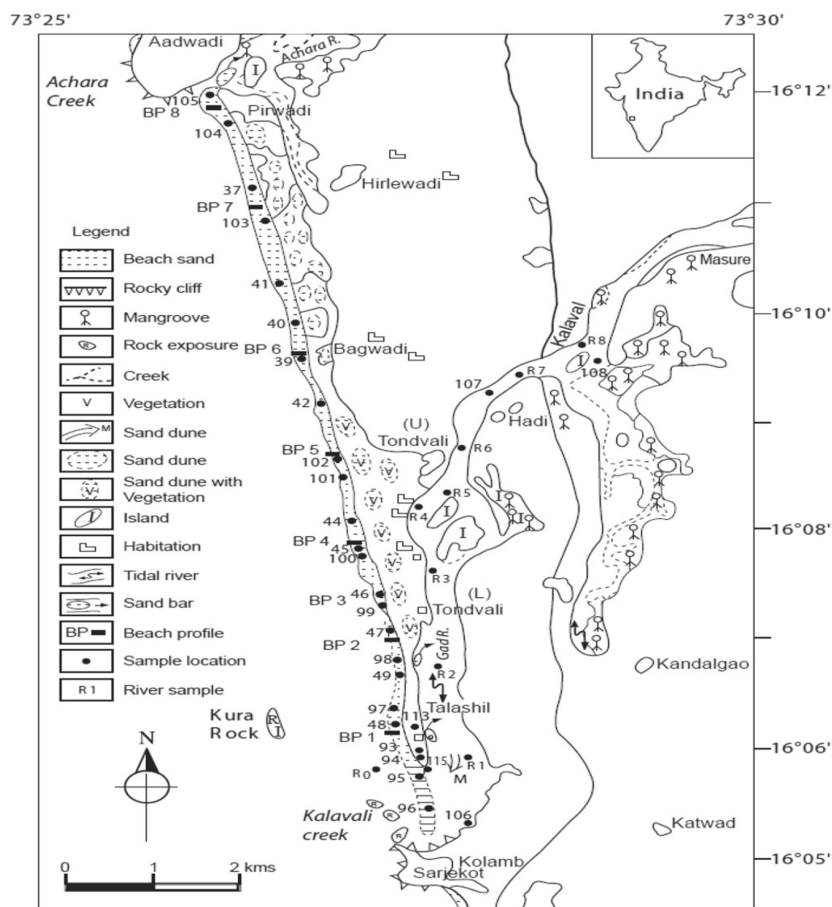
The proposal for G3 level exploration for critical metals: Titanium and Vanadium in Talashil block of Sindhudurg District, Maharashtra is based on the previous works conducted by NIO, Goa and Geo Marine Solutions Pvt Ltd (project proponent)

Previous work

AMD in 1999-2000 and 2000-2001 field seasons carried out reconnaissance survey over a length of 20km in Ratnagiri district for assessing the heavy mineral potential in the beach sands. They have covered the locations of Bhatya, Kalbadevi, Newre, Malgund and Varvada in Ratnagiri district (AMD, 2001). Gujar et al., 2022 reported mineralogy of fluvial and coastal sediments, with special attention to the heavy mineral placers between Vijaydurg and Redi Point along the 105 km stretch of the coastal area of Sindhudurg District, Maharashtra India. East–West sampling tracks were laid perpendicular to the beach at an interval of 500–700 m for the collection of samples within the promising areas of placer deposits that lies between Achara and Gad river mouths. The heavy minerals (up to 98 wt%, avg 27 wt%) identified are opaques (ilmenite, magnetite, chromite), pyroxenes, amphiboles, rutile, tourmaline, kyanite, staurolite, zircon, garnet, epidote, sillimanite and olivine, while quartz and feldspar form the light fractions. It is observed that the concentration of heavy minerals is more in the supratidal zone as compared to intertidal zone. The provenances for the minerals are igneous, metamorphic rocks and recycled sediments of Pre-Cambrian Age along with Deccan Trap basalts. Samples were collected up to 0.4m to 1.0m length below ground level. Major oxides in the separated ilmenite and magnetite grains were estimated using ICP-OES and the results pertaining to ten samples falling within the Talashil Block are given in the Table-1. The ilmenite varies between 39 and 51% and V_2O_5 ranges between 0.44 and 0.96% . The TiO_2 in magnetite fraction ranges between 14 and 24% and V_2O_5 between 3.78 and 4.76% (Gujar et al., 2022). The proposed Talashil Block covering a distance of about 12km coastal stretch lies between Achara and Gad River mouth.

Table-1: Geochemical analysis of ilmenite, magnetite and chromite from the study areas including Talashil Block (Source: Gujar et al., 2022).

Serial No	Area	Stn no.	TiO ₂	CaO	Cr ₂ O ₃	Fe ₂ O ₃	Feo	ZnO	V ₂ O ₅	NiO	MnO	MgO	Al ₂ O ₃	SiO ₂
Ilmenite														
1	Kotharwadi	k-7	50.69	1.00	0.01	15.70	25.30	0.39	0.44	–	0.78	0.96	1.40	0.38
2	Morve	32	48.60	0.27	0.44	16.30	26.15	0.11	0.92	0.08	1.05	1.84	1.21	2.10
3	Talashil	46	40.04	0.95	0.01	19.96	31.32	0.29	0.73	0.09	1.38	0.39	1.64	2.20
4	Talashil	47	46.60	0.85	0.01	18.05	26.20	0.28	0.60	0.09	1.05	0.22	1.27	2.25
5	Talashil	97	41.63	0.77	0.03	21.33	28.00	0.29	0.89	0.10	1.43	0.48	1.87	2.01
6	Talashil	48	44.57	1.44	0.01	16.81	30.30	0.26	0.76	0.05	0.89	0.26	1.02	2.42
7	Talashil	113	41.01	1.00	0.45	20.02	29.92	0.26	0.96	0.11	1.26	1.75	1.76	0.70
8	Bhogwe	61	38.89	0.48	0.07	20.00	33.26	0.29	0.66	0.08	1.20	0.36	1.29	2.21
Magnetite														
1	Kotharwadi	k-7	20.54	3.87	0.99	48.0	19.10	0.11	4.76	0.10	0.09	0.41	0.63	0.74
2	Morve	32	23.98	3.70	0.10	35.19	23.0	1.62	3.78	0.15	3.78	0.08	2.50	1.45
3	Talashil	46	22.86	5.30	0.02	32.80	19.10	1.49	4.71	0.20	4.40	0.06	2.20	1.85
4	Talashil	47	14.31	ND	0.70	46.0	22.10	0.06	3.78	0.34	1.05	ND	0.85	0.90
5	Talashil	97	22.00	5.62	0.02	32.40	24.10	2.58	3.85	0.16	3.95	0.05	1.39	1.02
6	Talashil	48	23.98	4.39	0.10	31.20	21.90	2.13	4.31	0.17	4.51	0.15	0.90	0.45
7	Talashil	113	21.00	5.05	0.04	37.52	22.00	1.75	4.65	0.19	4.38	0.09	1.86	0.86
8	Bhogwe	61	21.00	4.07	0.11	43.27	17.73	ND	4.23	0.16	4.18	0.12	3.02	1.30
Chromite														
1	Janoli	IIIb	0.05	2.25	33.62	3.54	22.34	0.03	0.12	0.34	0.76	12.61	14.96	5.32
2	Talashil	46	0.03	1.48	47.52	4.73	19.13	0.26	0.98	0.72	1.94	14.86	11.70	2.68
3	Talashil	97	0.79	3.75	34.76	4.36	23.52	ND	1.96	0.09	0.09	12.29	12.06	2.31
4	Talashil	48	0.48	3.86	32.06	4.32	21.32	0.42	2.46	0.15	3.35	13.16	10.86	3.60



(Representative map of part of the study area showing sampling locations and geomorphology between mouth of Achara and Gad rivers: Source: Gujar et al., 2022)



Fig 1. Photograph of Heavy Mineral Placers in a Dune Cut, Thondavali in Talashil Block (Source: Gujar et al., 2022)

In order to reconfirm the ilmenite-titanomagnetite and magnetite concentrations and to understand the prospects for V and Ti in the Talashil block (where Gujar et al., 2022 explored as mentioned above), Geo Marine Solutions Pvt Ltd., Mangalore carried out reconnaissance survey during the first week of January 2024. Studied the beach and dune areas and collected two samples (**13MR, Longitude: 73.45081°, Latitude: 16.14646° and 14MR, Longitude: 73.45287°, Latitude: 16.13544°**) to assess Ti and V contents in different mineral phases. The samples were beneficiated at IREL Laboratory, Kollam, Kerala. After separating into light and heavy fractions by gravity separator, heavy fractions were subjected to two levels of magnetic separation using LIRMS and REDMS separators to obtain magnetite, ilmenite-titanomagnetite, limonite and non magnetic fractions. The magnetic and non-magnetic fractions roughly constitute 50% each. The opaques that comprises three fractions viz; magnetite (12-14%), ilmenite-titanomagnetite (17-18%) and limonite (15-18%) were further analysed for Fe_2O_3 , TiO_2 and V_2O_5 by XRF at Shiva Analyticals (India) Pvt. Ltd; Bangalore (NABL Accredited lab). The results of the analysis done at IREL Lab and geochemical analysis done at Shiva Labs are given in **Table 2 and Table 3** respectively. The magnetite fractions (13 MR- A and 14 MR- A) show TiO_2 content is about 27% , V_2O_5 content is about 0.75% and Fe_2O_3 is in the range of 57 to 60%. The Ilmenite fractions (13 MR- B and 14 MR- B) show about 42% TiO_2 , V_2O_5 content is about 0.465% and Fe_2O_3 in the range of 47% . The limonite fraction (13 MR C and 14 MR C) shows TiO_2 content in the range of 11-19% , V_2O_5 content is in the range of 0.21% to 0.34% and Fe_2O_3 in the range of 37-47%. The results are given in the Table-2 & 3.

Table-2: Concentrations (%) of Magnetite, Ilmenite-Titanomagnetite and Limonite in the Sample Nos. 13MR and 14MR Collected within Talashil Block by Geo Marine Solutions Pvt. Ltd.

IREL (India) Limited, Research Centre.
Beach Road, P.B.No.38, Kollam 691001 Kerala

RC/MPL/EXT/2572 /407

16-01-2024

Sub: Separation of Magnetite, Titano Magnetite, Ilmenite from 8 samples.

Ref: Email dated. 11-01-2024, Letter dated 12-01-2024, Proforma Invoice No.78 dated 12-01-2024

SAMPLE NAME	IRERC Sample Ref. No.	Details of Separated fractions						Fractionss					
		Screen	LIRMS - Magnetics	REDMS Magnitecs	REDMS Middlings	REDMS Non Magnetics		Screen	LIRMS - Magnetics	REDMS Magnitecs	REDMS Middlings	REDMS Non Magnetics	
		+40#	MAGNETITE	ILMENITE	LIMONITE	Quartz, Feldspar, Shells	TOTAL	+40#	MAGNETITE	ILMENITE	LIMONITE	Quartz, Feldspar, Shells	TOTAL
Weight (gms)								Weight %					
3MR-	RC/04A/24	-	1013	154	284	188	1639	-	61.81	9.39	17.33	11.47	100.00
4MR-	RC/04B/24	-	339	124	72	178	713	-	47.55	17.39	10.10	24.96	100.00
5MR-	RC/04C/24	6	144	134	273	300	857	0.70	16.80	15.64	31.86	35.00	100.00
6MR	RC/04D/24	17	454	299	763	77	1610	1.06	28.20	18.57	47.39	4.78	100.00
11MR	RC/04E/24	1	1566	250	361	177	2355	0.04	66.50	10.62	15.32	7.52	100.00
12MR	RC/04F/24	1	428	173	216	366	1184	0.08	36.15	14.61	18.24	30.92	100.00
13MR	RC/04G/24	3	68	88	72	251	482	0.62	14.11	18.26	14.94	52.07	100.00
14 MR	RC/04H/24	5	67	93	98	283	546	0.92	12.27	17.03	17.95	51.83	100.00

Testing equipment used:

LIRMS	Low Intensity Roll Magnetic Separator
REDMS	Rare Earth Drum Magnetic Separator.

Process: Feed sample was screened through 40# (ASTM) Sieve and the 40# Undersize was tested on LIRMS. The LIRMS Magnetics was collected as Magnetite. The LIRMS Non magnetics fraction was further tested on REDMS and Magnetics, Middling and Non magnetics were collected. The fractions separated were re processed multiple times for purification and the final weights of each fraction is given above.

Prepared By:

Approved By:

Sabu Joseph
CM-Tech(Minerals)

IREL RRC KOLLAM

The results shows the Talashil block extending about 12 km in length and width that includes backshore and dune is between 150m and 550m is a potential zone for further exploration at G3 Level for critical minerals like vanadium and titanium.

Table-3: Iron, Titanium and Vanadium oxides in the separated fractions of magnetite, ilmenite-titanomagnetite and limonite (source: Geo Marine Solutions Pvt Ltd.)

SHIVA
Part of the Colson Group

SHIVA ANALYTICALS (INDIA) PRIVATE LIMITED

Plot No. 24D [P] & 34 D, KIADB Industrial Area, Hoskote
Bangalore – 562 114. Phone No: 080 – 2801 5333,
Website: www.shivaanalytics.com

Customer Name | Geo Marine Solution Private Limited 4-35/4(10), Sankaigudda, Bejai, Mangalore-575004, KARNATAKA

Discipline & Group Chemical & Ores and Minerals.

Customer Ref. | Samples received by courier, Lab

ID | G7650

Date Received | 17-Dec-24

Date Completed | 20-Jan-24

TEST REPORT

Sl. No.	Customer Code	Customer Description	METHOD	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/105	SOP/OM/103
			UNITS	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
			DL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.08	0.05	0.05	0.05	0.05	0.1
			Lab ID	Fe2O3	TiO2	V2O5	Cr2O3	Al2O3	CaO	K2O	MnO	MgO	Na2O	SO3	SiO2	P2O5	BaO	LOI
1	13MR-A	Powder	G7661-6	57.94	26.82	0.75	0.212	3.20	1.23	0.09	0.63	2.08	0.28	<0.05	6.70	0.06	<0.05	<0.1
2	13MR-B	Powder	G7650-16	47.34	42.37	0.46	0.058	1.23	0.95	0.05	0.43	2.07	<0.08	<0.05	4.93	<0.05	0.06	<0.1
3	13MR-C	Powder	G7650-17	36.67	10.59	0.21	0.203	7.18	5.56	0.21	0.33	6.96	0.37	<0.05	28.01	0.18	0.10	3.44
4	14MR-A	Powder	G7661-7	60.64	27.30	0.74	<0.05	2.33	0.97	0.07	0.64	1.62	<0.05	<0.05	5.48	<0.05	0.08	<0.1
5	14MR-B	Powder	G7650-18	47.91	42.45	0.47	0.069	1.17	0.89	<0.05	0.44	1.93	<0.08	<0.05	4.54	<0.05	0.07	<0.1
6	14MR-C	Powder	G7650-19	47.03	19.64	0.34	0.115	4.08	3.82	0.15	0.45	4.74	0.20	<0.05	18.14	0.08	0.12	1.10

Abbreviations

Accuracy and precision matrix, method and instrument dependent.

SOP/OM/103-- Loss On Ignition followed by Gravimetry

SOP/OM/105-- Fusion bead followed by WDXRF

DL--Detection Limit.

SATYANARAYANA -MANAGER - ORES & MINERALS
AUTHORISED SIGNATORY.

** END OF THE REPORT **

1. The results listed above pertain only to the tested samples and applicable parameters. 2. Samples which are degradable will be disposed immediately after testing and others will be disposed after one month from the date of issue of test certificate unless otherwise specified. 3. Total liability of our laboratory is limited to the involved amount. 4. This report is not to be reproduced either wholly or in part and cannot be used as an evidence in the Court of Law and should not be used in any advertising media without prior written permission. 5. In case any reconfirmation of contents of this test certificate is required, please contact our office. 6. Sampling is not done by us unless otherwise specified. 7. Any discrepancy in the Test Certificate should be notified within 30 days.



Fig.2: Proposed Exploration Block boundary marked in OSM E43T/8



Fig.3A: Proposed Sampling Point locations (75 Auger Borehole) at 400m x 200Grid size over Google earth imagery

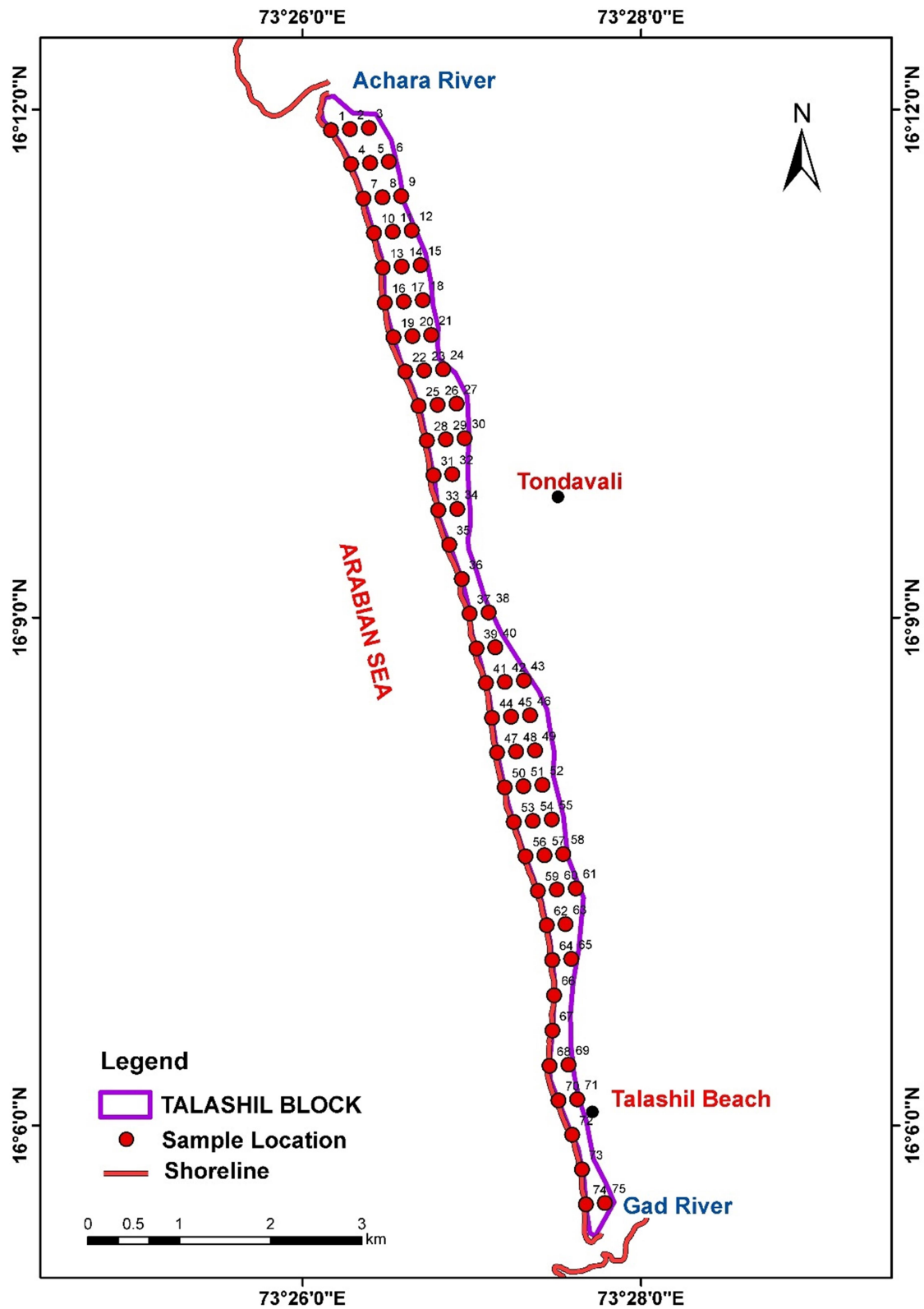


Fig.3B: Proposed Sampling Point locations (75 Auger Borehole) at 400m x 200m Grid size

Nature, Quantum and Target

The block comprises an area of 4.68 sq.km that falls in the old toposheet 47H/8 and OSM E43T/8 (Fig.2). The demarcated block area comprises geomorphic units of backshore and dune sediments. Mapping of the area in 1:10,000 scale incorporating all geomorphological units, manmade structures, streams etc. falling within the area of 4.68 sq. km would be undertaken to map the geology, land use pattern and geomorphological units. A total of seventy five sampling locations for auger drilling at an interval of 400m along the trend and 200m across is proposed. The proposed block boundary with 75 borehole locations are shown in Figures-3A & B. The sample point location details are given in Table.5.

The auger drilling would be accomplished to a depth of 6.0m below ground level or till the lowest level of unconsolidated sediment, whichever occurs first. The seventy five drill locations would yield a maximum of 450 sub samples by means of 1.0 m sub sampling downcore. The sub samples will be divided into two parts by means of coning and quartering. One part will be stored in the repository. From the other part, further two sub-parts would be made by repeated coning & quartering. The 450 sub-samples thus generated, would be subjected to grainsize analysis as per the GSI stipulated standard protocols. The other 450 sub-parts will go for mineral separation. After classifying the samples into light and heavy by means of gravity separation, the heavy fractions will be subjected to two level magnetic separation by means of LIRMS (Low Induced Rotary Magnetic Separator) and REDMS (Rare Earth Drum Magnetic Separator) to obtain magnetite, ilmenite-titanomagnetite, limonite fractions and non magnetic fraction. The two level magnetic separation would yield a total 1350 sub fractions of magnetite, ilmenite-titanomagnetite, limonite sub fractions apart from light and non-magnetic fractions.

From the above 1350 sub fractions, 10% of the samples (135 numbers) would be subjected to geochemical analysis for determining the Fe_2O_3 , TiO_2 , V_2O_5 concentration and other oxides using XRF. The presence of U and Th and all possible trace elements will be analysed by ICPMS. Further, 5 grains of each heavy mineral present in the non-magnetic fractions will be separated under petrological microscope and will be analysed using LA- ICPMS to understand the chemistry of each mineral phases.

XRD analysis of 15 samples of enriched fractions of ilmenite-titanomagnetite, magnetite and limonite would be conducted to understand the mineral phases. Resource estimation at G3 Level based on the drill core sample analysis results and Geological Report including the Mineral Resource Assessment at G3 level would be prepared.

Table 4: Nature, Quantum and Targets

Sl. No.	Description of Work	Quantum (Sq Km/ Number)	Time required
1	Geological , Geomorphological and Land Use mapping in 1:10000 scale	4.68 sq km	45 days
2	Auger drilling upto 6.0m BGL	75 nos	90 days
3	Grainsize analysis	450	120 days
4	Mineral Separation and Identification	450	120 days
5	Geochemical analysis for Ti, V ,Fe, and other oxides using XRF	135	30 days
6	Geochemical analysis of trace elements using ICPMS	135	30 days
7	XRD	15	20 days
9	Analysis of 5 grains each of individual minerals like zircon, monazite (if any), pyroxene, garnet, sillimanite etc by LA-ICPMS	25 grains	10 days
10	Resource estimation and report writing	1	60 days



Photo Showing Backshore and Dune with Enrichment of HM Placers near Tondavali (data source: Geo Marine Solutions Pvt. Ltd.)



Photograph Showing HM Layers on the Dune Cut-face along eastern Part of Dune (data source: Geo Marine Solutions Pvt. Ltd.)



Photo Showing Backshore and Dune with Enrichment of HM Placers north of Tondavali (Source: Geo Marine Solutions Pvt. Ltd.)

Table 5: Details of proposed sample locations

Sample No.	Longitude	Latitude		Sample No.	Longitude	Latitude
1	73.43612	16.19796		39	73.45045	16.14695
2	73.43799	16.19808		40	73.45232	16.14706
3	73.43985	16.1982		41	73.45139	16.14355
4	73.4381	16.19463		42	73.45326	16.14367
5	73.43997	16.19475		43	73.45512	16.14378
6	73.44183	16.19486		44	73.452	16.14012
7	73.43932	16.19124		45	73.45387	16.14024
8	73.44119	16.19136		46	73.45573	16.14036
9	73.44305	16.19148		47	73.45249	16.13669
10	73.44035	16.18785		48	73.45436	16.13681
11	73.44222	16.18797		49	73.45622	16.13693
12	73.44408	16.18809		50	73.45322	16.13327
13	73.44122	16.18444		51	73.45509	16.13339
14	73.44309	16.18456		52	73.45695	16.13351
15	73.44495	16.18468		53	73.45414	16.12987
16	73.44142	16.18099		54	73.45601	16.12999
17	73.44329	16.18111		55	73.45787	16.13011
18	73.44515	16.18123		56	73.45528	16.12648
19	73.44227	16.17759		57	73.45715	16.1266
20	73.44414	16.17771		58	73.45901	16.12672
21	73.446	16.17782		59	73.4565	16.12309
22	73.44344	16.1742		60	73.45837	16.12321
23	73.44531	16.17432		61	73.46023	16.12333
24	73.44717	16.17443		62	73.45737	16.11969
25	73.44476	16.17082		63	73.45924	16.11981
26	73.44663	16.17094		64	73.45792	16.11626
27	73.44849	16.17105		65	73.45979	16.11638
28	73.44556	16.16741		66	73.45811	16.11281
29	73.44743	16.16753		67	73.45794	16.10933
30	73.44929	16.16765		68	73.45766	16.10585
31	73.44621	16.16399		69	73.45953	16.10597
32	73.44808	16.16411		70	73.45852	16.10245
33	73.44669	16.16056		71	73.46039	16.10257
34	73.44856	16.16068		72	73.45988	16.09907
35	73.44778	16.15716		73	73.46085	16.09567
36	73.44902	16.15378		74	73.46124	16.09223
37	73.44978	16.15037		75	73.46311	16.09235
38	73.45165	16.15048		-	-	-

Reference:

Anup R. Gujar, Sridhar D. Iyer, Girish A. Prabhu, Premchand G. Mislankar and Navaso V. Ambre., 2022. Multi-mineral potential of littoral placers of Sindhudurg District, Maharashtra, West coast of India. Environmental Earth Sciences, 81:161
<https://doi.org/10.1007/s12665-022-10260-9>

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Table 6: Cost break-up table for G3 Level Exploration in Talashil Block, Maharashtra for Titanium and Vanadium

SI No	Description	UNIT	expected number	Unit rate	Total amount.
1	Accommodation charges for drilling team	months	3	50,000	1,50,000
2	Camp setting and winding up cost	L.S	1	2*250000	5,00,000
3	Mobilisation/Demob of drill rig from HQ (Mangalore to Dandi)	km by road	495*2	36	35,640
4	Drilling:, (0-6 m in sediment)	meter	450	4760	21,42,000
5	Geologists- on field (mapping) -2 geol for 45 days	days	90	11000	9,90,000
6	Geologists- on field (drill site)- 2 geol for 90 days	days	180	11000	19,80,000
7	Geologist -office work -	days	300	9000	27,00,000
8	Surveyor – mapping -1 No	days	45	8300	3,73,500
9	Labourers -mapping - 2nos.	days	90	473	42,570
10	Labourers -for drilling point fixing	days	150	473	70,950
11	Sample processing charges	days	225	5100	11,47,500
12	Core sample preservation- core box	number	450	1590	7,15,500
13	Heavy Mineral separation by gravity and 2 level magnetic separation(magnetite, ilmenite, titanomagnetite)	number	450	13820	62,19,000
14	Chemical analysis of enriched samples by XRF (NABL lab)	number	135	4200	5,67,000
15	Chemical analysis of non-mag HM fraction for U, Th by LA-ICPMS	number	25	7731	1,93,275
16	XRD analysis	number	10	4000	40,000
17	Mineralogical Study under microscope	number	15	4232	63,480
	Sub total 1				1,79,30,415
18	Preparation of Mineral Exploration Report (3% of sub total1)	L S			5,37,912
	Sub total 2				1,84,68,327
19	Preparation of Exploration Proposal (2% of sub total 2)	L.S			3,69,367
	Total				1,88,37,694
	Total with GST @ 18%				2228478.92
				rounded off	2,22,28,479