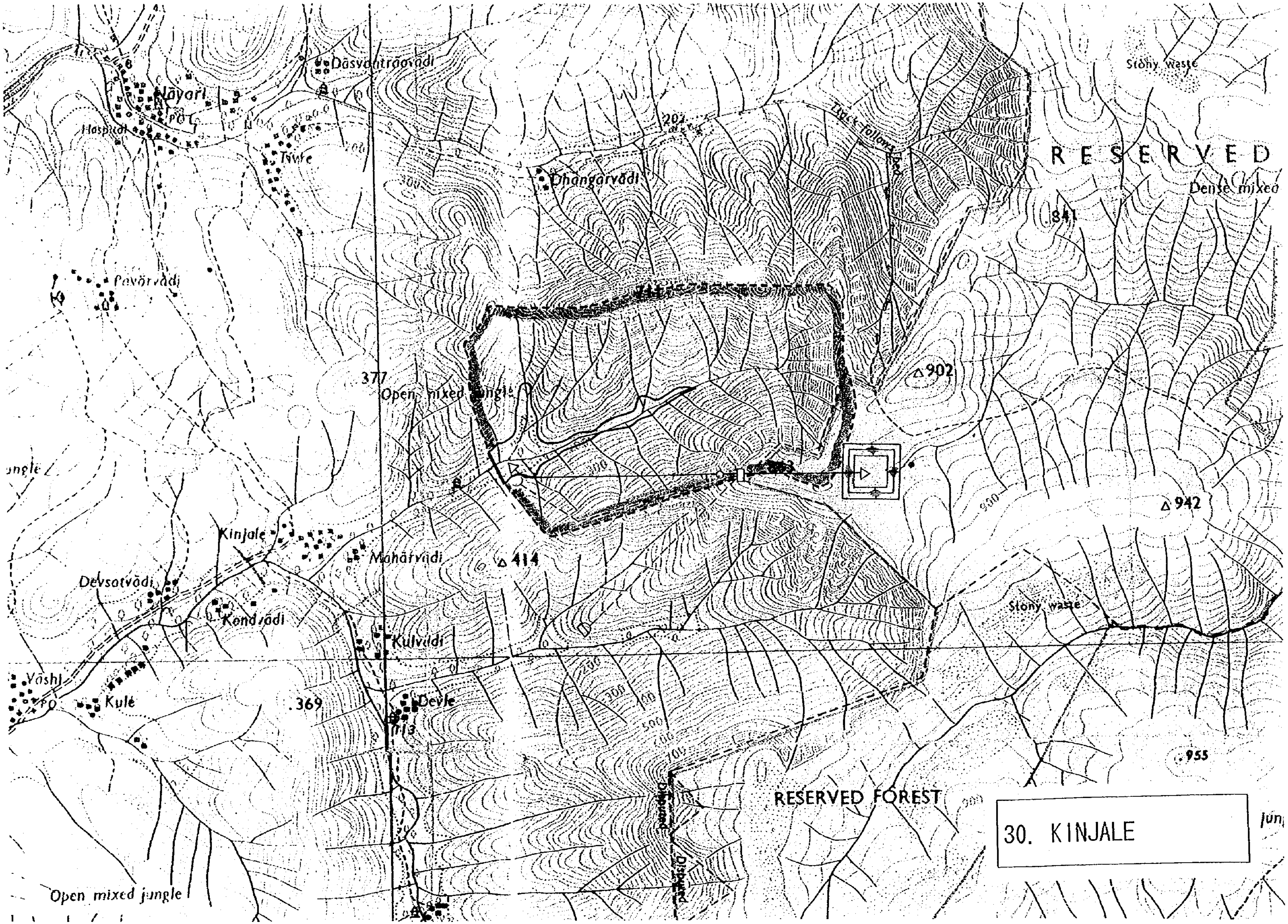
30. General Description of the KINJALE Project Site

1. Environment conditions	(1) Upper reservoir		The submerged area involves 12 ha of reserved forest
	(2) Lower reservoir		The submerged area involves 18 ha of non-reserved forest and 10 ha of agricultural land
2. River basin conditions	(1) Upper reservoir	(1) River basin	The artificially excavated and embanked pondage is to be layouted on a plateau of 800m elevation in the most upstream part of the river Gadgadi Nadi, a tributary emptying into the river Sonvi Nadi on the right bank.
		(2) Submerged dwellings	As it is an artificial pondage, there is no submerged dwelling.
		(3) River bed condition	Non
		(4) Circum-reservoir terrain	The plateau forms a tableland of 800m elevation.
	(2) Lower reservoir	(1) River basin	The basin is located in the most upstream part of the river Gadgadi Navi. The watershed peak is a steep mountainous area with a ridgeline of steep cliffs. Only the river has a gentle gradient near the reservoir.
		(2) Submerged dwellings	Because of the steep topography, there is no dwelling.
		(3) River bed condition	The main river branches off into numerous mountain streams. Only the main stream, however, has signs of gouged-out/washed-out rock. Near the reservoir, the terrain has a relatively gentle gradient. It is not likely that the river bed is covered with thick deposits.
		(4) Circum-reservoir terrain	The terrain around the reservoir is flanked by steep slopes. It is assumed the fresh rock is exposed.
	(3) Changes in river basin		As the artificial pondage is adopted, this river basin is considered not to need any changes to the natural relief. The reconnaissance study, however, was proved that the upper pondage is belonged to the basin of the opposite direction.
3. Location and condition of structures	(1) Upper reservoir dam	(1) Dam site status	Non
		(2) Dam	The effective water storage capacity of this artificial pondage is 3×10^5 m^3. The storage capacity of the lower reservoir is the limit. It would be economically out of the question to raise the dam height on the upper pondage.
	(2) Lower reservoir dam	(1) Dam site status	The upper reaches have a rapid river flow. Near the reservoir, the river dips at a relatively gentle gradient. The river basin has a small catchment area, so that the amount of rock washed down is actually small. On both banks of the dam site, the topography shows steep gradients and narrow ridges.
		(2) Dam	The location is somewhat favorable for the siting of the dam, but even when the dam height is raised, the water storage efficiency remains poor. Nor would it be economically advantageous to try to increase output by raising the dam height any further.
	(3) Waterway route	(1) Geographical profile	The waterway system layout has been determined by taking into consideration the natural relief. This steep mountainous relief changes to a flat plain near the plateau on the upper pondage, and past this point there are few undulations.
		(2) Layout	The waterway system has a total extended length of 3.5km. In view of the topographical constraints, the powerhouse has to be located on the intake side. No headrace tunnel needs constructing.
	(4) Intake and outlet		Since the upper pondage is artificial type, the intake needs a morning glory type structure. The outlet is to be constructed using an ordinary horizontal type of structure.
	(5) Surge tank		Since there is no headrace, there is also no need to provide a surge tank on the intake side. The tailrace has a significant length of 2.6km. This requires the construction of a surge tank.
	(6) Powerhouse		The powerhouse is located on the intake side. The structures belonging to the powerhouse therefore take an uneconomic layout.
4. Access road and tunnel	(1) Upper and lower reservoirs		For access to the upper pondage an access road of approximately 10km length needs to be led from the existing road at Peth. For access to the lower reservoir, a new stretch of road of approximately 2km length needs to be constructed, forking off from the existing road at Kinjale.
	(2) Access tunnel to powerhouse		A 1.8km long access tunnel is to be provided from the left bank of the lower reservoir to connect to the powerhouse.
	(3) Cable tunnel		The switchyard is to be layouted near the entrance of near the access road to the powerhouse. From this point, an approximately 1.8km long cable tunnel is required on the plan to connect to the underground transformer room.
5. Power transmission lines			To construct the 400kV one circuit, double conductors, 45km from Kinjale PPS to planning of New Koyna S/S.
6. General evaluation			This project uses an artificial pondage type structure for the upper pondage. It has a high water head, however, the lower reservoir has a limited water storage capacity. Consequently, the power output is not large. Thus, the project has a somewhat inferior economic efficiency, though there are also few areas of submerged forest.

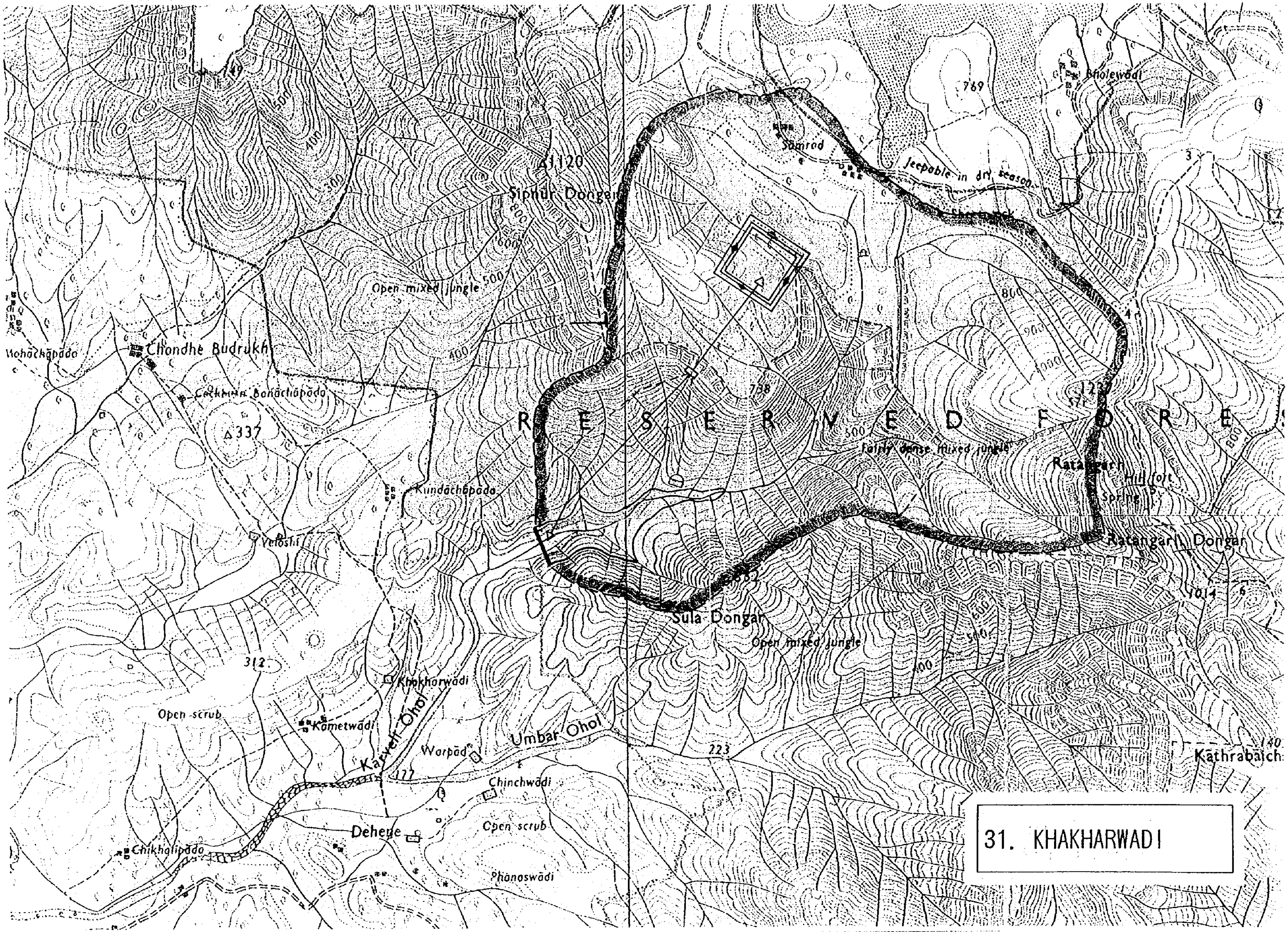


Dasvantraovadi
Nayari
PO
Hospital
Tivre
Dhangarvadi
RESERVED
Dense mixed
841
Stony waste
Pavarvadi
377
Open mixed jungle
902
942
Kinjale
Maharvadi
414
Devsotvadi
Kondvadi
Kulvadi
Stony waste
Vashi
PO
Kule
369
Devle
955
RESERVED FOREST
Open mixed jungle

30. KINJALE

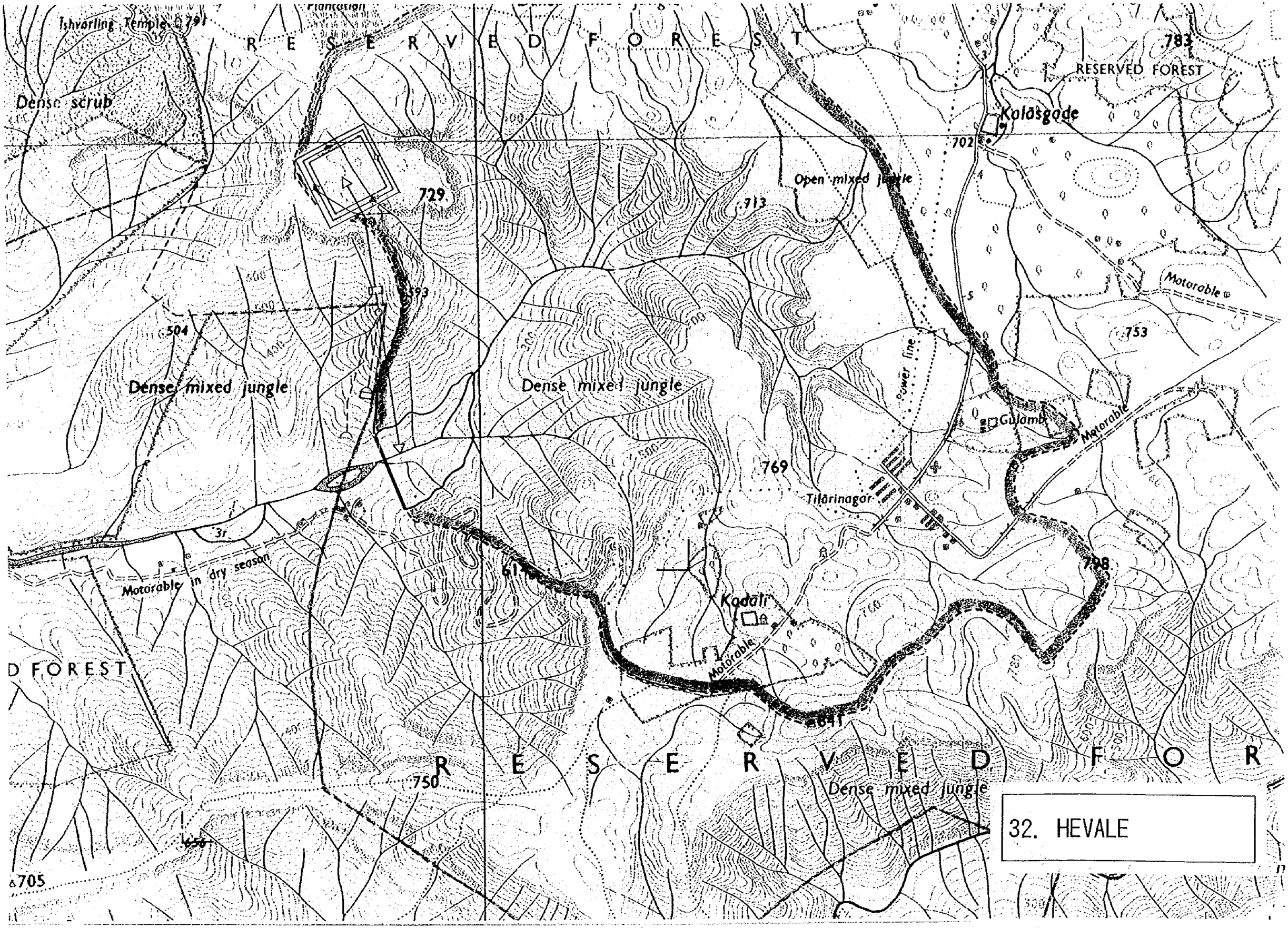
31: General Description of the KHAKHARWADI Project Site

1. Environment conditions	(1) Upper reservoir		The submerged area involves 24 ha of non-reserved forest
	(2) Lower reservoir		the submerged area involves 30 ha of reserved forest and 5 ha of agricultural land
2. River basin conditions	(1) Upper reservoir	(1) River basin	The artificially excavated and embanked type pondage is to be layouted on a plateau of 750m elevation in the most upstream part of the river Karuveli Ohol, a tributary emptying into the river Shal on the right bank.
		(2) Submerged dwellings	As it is an artificially created pondage, there is no submerged dwelling.
		(3) River bed condition	Non
		(4) Circum-reservoir terrain	Near the reservoir, terrain forms a plateau. On the south side, there are steep cliffs towards the lower reservoir.
	(2) Lower reservoir	(1) River basin	The basin is located upstream of the river Karveli Ohol, and the most upstream part forms a plateau of 700 ~ 800m elevation. Past the steep cliffs the steep slopes dip toward the river. Both bank of the river have a relatively gentle topography.
		(2) Submerged dwellings	It is not a flat plain. Consequently, there is no dwelling here.
		(3) River bed condition	The river in its most upstream part flows through a gently inclined highland plateau. At around 700m elevation, it passes through steep cliffs and becomes a rapid torrent. At the 2km upstream of the dam site there is a confluence of two streams merging, with the river forming a gentle gradient to empty into the reservoir.
		(4) Circum-reservoir terrain	The terrain around the reservoir, including both banks, has comparatively gentle gradient, with being assumed to be the deposits of rock debris. Only around the dam site does the relief become steep on both banks.
	(3) Changes in river basin		The artificial type pondage is in the most upstream part of the Karveli Ohol river. The lower reservoir is to be located at a distance of 2.6km from the upper pondage. This river basin does therefore not need any changes to the natural water flow.
3. Location and condition of structures	(1) Upper reservoir dam	(1) Dam site status	Non
		(2) Dam	The effective water storage capacity is 5.7×10^6 m^3
	(2) Lower reservoir dam	(1) Dam site status	Both banks have steeply dipped slopes. They are narrow, and the dam is to be sited in a position in which the river bed has a relatively steep gradient. There are few deposits on the river bed.
		(2) Dam	On both banks of the dam site, a steep gradient of slope is formed. It is a favorable location for siting the dam, but even when the dam height is raised, the water storage efficiency remains poor and no further increase in storage capacity can be expected. The limit for the dam height at present is considered to be 80m.
	(3) Waterway route	(1) Geographical profile	The waterway system has been selected by taking into consideration the natural relief. From the intake the terrain forms a flat plateau. After this there are slopes dipping down smoothly without undulations towards the lower reservoir.
		(2) Layout	For topographical reasons, a penstock line runs immediately from the intake, passing through the powerhouse to terminate in the tailrace. As a result, there is the weakness that the tailrace from the powerhouse is rather long.
	(4) Intake and outlet		Since the pondage is planned as an artificial type, the intake uses a morning glory type structure while the outlet is planned as a normal horizontal type structure.
	(5) Surge tank		Since there is no headrace, there is also no need to provide a surge tank on the intake side. As the tailrace tunnel is rather long as 1.6km, this requires the construction of a surge tank.
	(6) Powerhouse		The powerhouse is located on the intake side at a position of 1.6km from the outlet. The access tunnel to the powerhouse is therefore rather long.
4. Access road and tunnel	(1) Upper and lower reservoirs		For access to the upper pondage a new access road of approximately 1km length needs to be led from the existing road which passes through Samrad. For access to the lower reservoir, a new stretch of road of approximately 4km length needs to be constructed, forking off from the existing road.
	(2) Access tunnel to powerhouse		A 2.3km long tunnel is to be built from the right bank of the lower reservoir dam.
	(3) Cable tunnel		The switchyard is to be layouted near the dam site on the lower reservoir. From this point, an approximately 0.8km long inclined tunnel is to connect to the transformer room.
5. Power transmission lines			To construct the 400kV one circuit, double conductors, 50km from Khakharwadi PPS to Padghe S/S along planning of the 500kV HVDC transmission line between Chandrapur S/S and Padghe S/S.
6. General evaluation			This project uses a pondage type structure for the upper pondage. The reservoir storage capacity is by no means inferior, but it has a somewhat low head in the order of 400m. This site is therefore not an economically favorable site, though there are few areas of submerged forest.


Bholeswadi
769
Samrod
Jeepable in dry season
1120
Siphur Dongar
Open mixed jungle
Mohachapado
Chondhe Budrukh
Bonachapado
337
738
R E S E R V E D F O R E S
Fairly dense mixed jungle
1237
Ratangarh
Hill fort
Spring
Ratangarh Dongar
Kundachapado
Veloshi
Sula Dongar
Open mixed jungle
1014
312
Khokharwadi
Open scrub
Kometwadi
Karvali Ohol
Umbar Ohol
Warpad
223
Kathrabaich
Chinchwadi
Dehene
Open scrub
Chikhalipado
Phanoswadi
31. KHAKHARWADI

32. General Description of the HEVALE Project Site

1. Environment conditions	(1) Upper reservoir		The submerged area involves 32 ha of reserved forest
	(2) Lower reservoir		The submerged area involves 50 ha of reserved forest
2. River basin conditions	(1) Upper reservoir	(1) River basin	The excavated and embanked pondage is to be built in a hilly area on a plateau in the order of 700m elevation in the most upstream part of the river Kharal Nadi, a tributary emptying into the river Tilari Nadi on the right bank.
		(2) Submerged dwellings	As the plan is the artificially created pondage, the site is selected with no submerged dwelling.
		(3) River bed condition	Non
		(4) Circum-reservoir terrain	The relief is a hilly plateau in the order of 700m elevation with the grass area. Except for the north side, the relief consists of the rock exposed steep cliffs.
	(2) Lower reservoir	(1) River basin	The river basin is located upstream of the Kharal Nadi and the most upstream part of this river forms a hilly plateau of over 700m elevation. Past this plateau, the relief is one of steep mountains with overhanding cliffs in some parts. From the skirting areas of the reservoir, the terrain marks a drop in elevation toward the river with its gentle gradient of flow.
		(2) Submerged dwellings	The reservoir is planned at a location in which the steep mountainous terrain becomes somewhat more gentle. There is no dwelling.
		(3) River bed condition	At a position approximately 0.5km upstream of the dam site, the river branches off into two streams extending to the plateau which forms the watershed peak of the basin. These streams divide into innumerable mountain streams and the signs of erosion are in evidence. Near the dam site there are rock debris layers which are not thought to be of any considerable depth.
		(4) Circum-reservoir terrain	In the terrain around the reservoir on the left bank in the upper reaches, the topography is relatively gentle and there are somewhat deposits of rock debris. Apart from this, the surrounds of the reservoir present a gentle topography. The rock bed is exposed with the thin deposits.
	(3) Changes in river basin		The upper pondage is located on a plateau in the most upstream part of the same river Kharal Nadi. The lower reservoir is located further downstream so that this river basin does not need any changes to the natural water flow.
3. Location and condition of structures	(1) Upper reservoir dam	(1) Dam site status	Non
		(2) Dam	The effective storage capacity of this artificial pondage is estimated as 7.6×10^6 m^3.
	(2) Lower reservoir dam	(1) Dam site status	On both banks of the dam site, the relief has a steep gradient and the rock bed is not deep. Near the river bed the gradient eases to a gentle slope, with evidence that there are somewhat deposits at the both banks of the river.
		(2) Dam	On both banks of the dam site, the relief has a steep gradient, and the dam basement has a relatively wide. Great increasing of the storage capacity by raising the dam height is not an economically tenable proposition, as the water storage efficiency is poor because of the steep relief on both banks around the reservoir.
	(3) Waterway route	(1) Geographical profile	The waterway system layout has been selected by taking into consideration the natural relief. The perpendicular relief shows few undulation past the plateau on which the upper reservoir is located. The slops fall at a gentle gradient towards the lower reservoir.
		(2) Layout	Because of the short stretch of the plateau on which the pondage is provide, the waterway system is layouted so that a penstock line runs from the intake and connects to the tailrace, with the powerhouse located on the intake side. The waterway system has a small total extended length of only 2.5 km.
	(4) Intake and outlet		Since the upper pondage is an artificial type, the intake requires a morning glory type structure. The outlet is to be constructed using an ordinary horizontal type of structure.
	(5) Surge tank		The upper pondage needs no headrace and, consequently, there is no need to provide a surge tank on the intake side. The tailrace is 1.45km long, however, so that it requires the construction of a surge tank.
	(6) Powerhouse		The powerhouse is located at a position 1.45km from the outlet, situated deep underground a little close to the intake.
4. Access road and tunnel	(1) Upper and lower reservoirs		For access to the upper reservoir an access road of approximately 1.5km length needs to be led from the existing road which passes through the outskirts of the village Dhangarvadi. For access to the lower reservoir, however, there is already a nearby road in existence.
	(2) Access tunnel to powerhouse		A 1.5km access tunnel is planned to be provided from the right bank of the lower reservoir.
	(3) Cable tunnel		The switchyard has to be built downstream of the lower reservoir in the same manner as the access tunnel to the powerhouse. A 1.5km long cable tunnel is required on the layout to connect to the underground transformer room.
5. Power transmission lines			To construct the 400kV one circuit, double conductors, 100km from Hevale PPS to Kolhapur II S/S along the 220kV double circuits transmission line between Ponda S/S and Kolhapur II S/S.
6. General evaluation			This project is consisted of the artificial pondage type and has a water storage capacity in the order of 1,000mw with a short extended length of the waterway. Since the powerhouse is located close to the intake, the construction costs for the structures belonging to the powerhouse are somewhat high, making it the project of somewhat poor economic efficiency. There are however a little big areas of submerged forest on the lower reservoir.


Ishvarling Temple
Plantation
RESERVED FOREST
783
Dense scrub
Kolasgode
702
729
713
Open mixed jungle
593
504
Motorable
753
Dense mixed jungle
Dense mixed jungle
Power line
Gulamb
Motorable
769
Tilarinagar
Motorable in dry season
Kadali
Motorable
750
656
705
RESERVED FOREST
Dense mixed jungle
32. HEVALE

Appendix 2 Drilling Log

Fig. APP.2-1 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	14/DEC./1995 ~ 20/FEB./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**LJ-1**	**Elevation**	R.L. 310.8 m	**Total Depth**	70.00 m	**Location**	JARONDPROJECT SITE
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description
1				OVERBURDEN	REDDISH BROWN SOIL & BASALT BOULDER POOR CORE RECOVERY
2					
3	307.05	3.75			
4				PORPHYRITIC AMYGDALOIDAL BASALT	THE LENGTH OF PIECE IS 5 TO 24CM POOR CORE RECOVERY
5					
6					
7					
8	302.60	8.20			
9				COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND GREEN INFILLINGS	DARK GREY FRESH HARD BASALT VERTL. AND HORZL. JOINTS CONFIRMED, SOME JOINTS SURFACE ARE STAINED BROWN LENGTH OF PIECE 7 TO 38CM METAL SOUND BY HAMMER BLOW
10					
11					
12					
13					
14					
15					
16					
17					
18					
19	291.40	19.40			
20				AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN INFILLINGS	21.95 to 23.55m FROM PIECE NO.133 TO 153 BROWN DUE TO HYROTHERMAL ALTERATION CONCENTRATION OF WHITE INFILLINGS.
21					
22					
23					
24					
25					
26					
27					

Core Recovery —×— (%)
RQD [%]
0 50 100

Rock Classification: 0.35 km/s | B | 4.60 km/s | B

VP (km/s)

Water Table: NIL

N-Value: 18 | 34 | 21

LUGEON VALUE
0 10 20

S. P. T
N VALUE
0 10 20 30 40 50

16.85 | 2 | 19.85 | 2 | 22.85 | 0.2 | 25.85 | 0.2

U.C.S (kgf/cm²)
14.05 | LOST | 14.25
20.47 | 1506 | 20.80
24.60 | 415 | 24.97

Remarks

302.60 8.20

COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND GREEN INFILLINGS

DARK GREY FRESH HARD BASALT

VERTL. AND HORZL. JOINTS CONFIRMED, SOME JOINTS SURFACE ARE STAINED BROWN

LENGTH OF PIECE 7 TO 38CM

METAL SOUND BY HAMMER BLOW

291.40 19.40

AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN INFILLINGS

21.95 to 23.55m
FROM PIECE NO.133 TO 153 BROWN DUE TO HYROTHERMAL ALTERATION CONCENTRATION OF WHITE INFILLINGS.

35.10 to 36.60m
PIECE NO.203 TO WHITE AMYGDALLS

AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN INFILLINGS

42.55 to 44.05m
ZEOLITE CAVETY IN PIECE
PIECE NO.240

262.80 48.00

(40) (76) (84) (90) (56) (56) (87) (81) (58) (80) (83) (83) (87) (87) (85) (85) (83) (83) (87) (87) (93) (93) (91) (91) (83) (83) (97) (97) (85) (85) (94) (87) (93) (99) (97) (97) (98) (98) (96) (96) (97) (97) (96) (96) (94) (94) (96) (96) (95) (95) (97) (97) (100) (100) (92) (92) (95) (95) (95) (96) (98) (98) (94) (94) (96) (96) (95) (95) (97) (97)

4.60 km/s

B

A ≀ B

FIELD PERMEABILITY TEST (16.85 to 69.85m)

16.85 2 19.85 2 22.85 0.2 25.85 0.2 28.85 0.2 31.85 0 34.85 0 37.85 0 40.85 0.1 43.85 0.2 46.85 0 49.85

14.05 1002 14.25

20.47 1506 20.80

24.60 415 24.97

34.80 502 35.10

47.00 314 47.35

35.10 to 36.60m
PIECE NO.203 TO WHITE AMYGDALLS

42.55 to 44.05m
ZEOLITE CAVETY IN PIECE
PIECE NO.240

AMYGDALOIDAL BASALT
WITH SMALL TO LARGE
GREEN INFILLINGS

262.80 48.00

50.00 to 51.55m
CONCENTRATION OF WHITE
AMYGDALLS IN PIECE NO.279 TO 283

53.00 to 54.50m
ZEOLITE VEIN IN PIECE NO.287,288,289

59.00 to 60.55m
CONCENTRATION OFWHITE
AMYGDALLS IN PIECE NO.307 TO 310

60.55 to 62.05m
LARGE PIPE AMYGDALLS IN PIECE
NO.310

244.80 66.00

240.80 70.00

FIELD PERMEABILITY TEST (

34.80
50Z
35.10

47.00
314
47.36

59.00
252
59.36

Fig. APP.2-2 **DRILLING LOG**

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA				
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY	**DATE**	12/DEC./1995 ~ 5/FEB./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD	**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	LJ-2	**Elevation**	R.L. 240.8 m	**Total Depth**	70.00 m
Location	JAROND PROJECT SITE				
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits	Diameter of Hole : NX (mm)		**Sheet No.**	OF

Elevation in m	Depth in m	Type of Rock	Description
238.55	2.25	RIVER DEPOSIT	POOR RECOVERY BASALT BOULDER THE LENGTH OF PIECE IS 6 TO 9CM
237.07	3.73	AMYGDALOIDAL BASALT	SLIGHTLY WEATHERED THE LENGTH OF PIECE IS 5 TO 24CM
230.35	10.45	COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENEOCRYSTS AND SMALL TO LARGE GREEN INFILLINGS	3.37 to 5.00m PIECE NO.17 TO 20 ZEOLITE VEIN 5.00 to 6.00m PIECE NO.30 TO 33 ZEOLITE VEIN 8.00 to 8.55m PIECE NO.67 TO 72 JOINT AT VARIOUS ANGLLES STAINED
215.90	24.90		13.85 to 14.85m PIECE NO.108 CONCENTRATION OF WHITE INFILLINGS ZEOLITE CAVITIES IN PIECE NO 110B TO 116 17.75 to 19.20m ZEOLITE CAVITES IN PIECE NO.117,124B,125,126

Core Recovery —×— (%): (0), (37), (65), (97), (73), (98), (73), (88), (100), (91), (83), (91), (99), (96), (100), (100), (100), (100), (96), (93), (100), (97), (97), (100), (100)

RQD [%]: [61], [98], [63], [83], [93], [64], [22], [87], [98], [96], [100], [100], [100], [100], [96], [93], [100], [97], [97], [100], [100]

Rock Classification: B, B, A

VP (km/s): 0.40 km/s; 4.60 km/s

Water Table: NIL

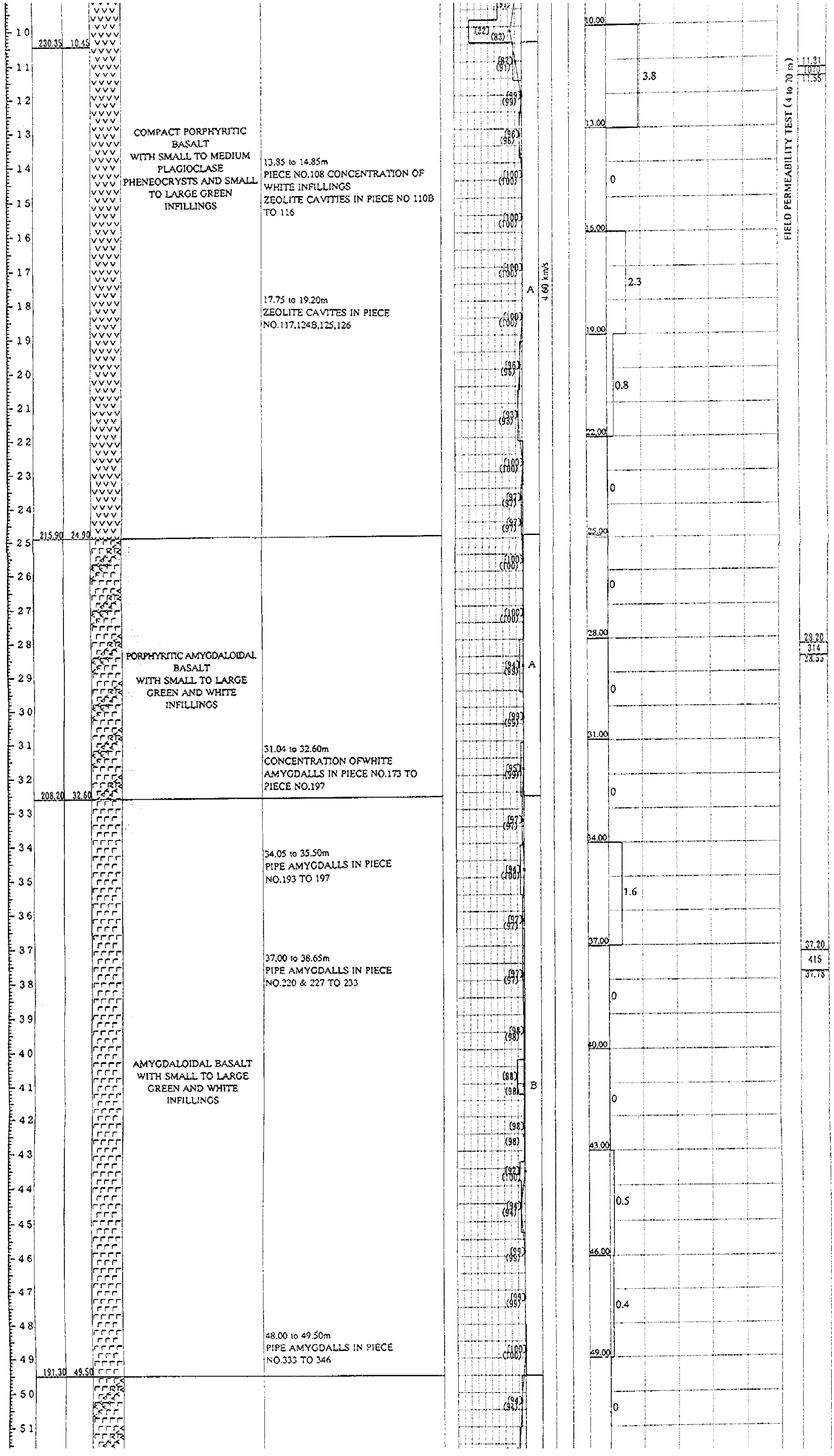
N-Value: 50/0

Depth (m)	LUGEON VALUE
4.00 – 7.00	4
7.00 – 10.00	4
10.00 – 13.00	3.8
13.00 – 16.00	0
16.00 – 19.00	2.3
19.00 – 22.00	0.8
22.00 – 25.00	0
25.00 –	0

U.C.S (kgf/cm^2): 2.99 / 546 / 3.35; 11.31 / 1070 / 11.55

FIELD PERMEABILITY TEST (4 to 70 m)

Remarks:


230.35
10.45
COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENEOCRYSTS AND SMALL TO LARGE GREEN INFILLINGS
13.85 to 14.85m
PIECE NO.108 CONCENTRATION OF WHITE INFILLINGS
ZEOLITE CAVITIES IN PIECE NO 110B TO 116
17.75 to 19.20m
ZEOLITE CAVITES IN PIECE NO.117,124B,125,126
A
4.60 km/s
215.90
24.90
PORPHYRITIC AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN AND WHITE INFILLINGS
31.04 to 32.60m
CONCENTRATION OFWHITE AMYGDALLS IN PIECE NO.173 TO PIECE NO.197
208.20
32.60
34.05 to 35.50m
PIPE AMYGDALLS IN PIECE NO.193 TO 197
37.00 to 38.65m
PIPE AMYGDALLS IN PIECE NO.220 & 227 TO 233
AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN AND WHITE INFILLINGS
B
48.00 to 49.50m
PIPE AMYGDALLS IN PIECE NO.333 TO 346
191.30
49.50
10.00
3.8
13.00
0
16.00
2.3
19.00
0.8
22.00
0
25.00
0
28.00
0
31.00
0
34.00
1.6
37.00
0
40.00
0
43.00
0.5
46.00
0.4
49.00
0
FIELD PERMEABILITY TEST (4 to 70 m)
11.31
1070
11.55
28.20
314
28.55
37.20
415
37.78

Elevation	Depth (m)	Description	Remarks
	33 – 49.50	AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN AND WHITE INFILLINGS	34.05 to 35.50m PIPE AMYGDALLS IN PIECE NO.193 TO 197 37.00 to 38.65m PIPE AMYGDALLS IN PIECE NO.220 & 227 TO 233 48.00 to 49.50m PIPE AMYGDALLS IN PIECE NO.333 TO 346
191.30	49.50		
	49.50 – 61.50	PORPHYRITIC AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN INFILLINGS	MAXIMUM LENGTH OF CORE IS 57 TO 66CM
184.00	56.80		
179.30	61.50		
	61.50 – 70.00	AMYGDALOIDAL BASALT WITH SMALL TO LARGE WHITE AND GREEEN INFILLINGS	61.50 to 36.10m CONCENTRATION OF WHITE INFILLING IN PIECE NO.414 TO 426 64.70 to 66.05m PIPE AMYGDALLS IN PIECE NO.425,426 66.05 to 67.60m PIPE AMYGDALLS IN PIECE NO.433,434 MAXIMUM LENGTH OF CORE IS 58 TO 60CM
170.80	70.00		

Core recovery / RQD (per 0.5 m): (97)(97), (94)(100), (97)(97), (97)(97), (98)(98), (88)(98), (98)(98), (92)(100), (94)(94), (99)(99), (99)(99), (100)(100), (94)(94), (91)(91), (100)(100), (95)(95), (99)(99), (92)(92), (96)(96), (97)(97), (99)(99), (96)(96), (98)(98), (99)(99), (100)(100), (87)(87)

Weathering grade: B (to 49.50), B (49.50–56.80), A (56.80–61.50), A (61.50–70.00)

From (m)	To (m)	Value
34.00	37.00	1.6
37.00	40.00	0
40.00	43.00	0
43.00	46.00	0.5
46.00	49.00	0.4
49.00	52.00	0
52.00	55.00	0
55.00	58.00	0
58.00	61.00	0
61.00	64.00	0.3
64.00	67.00	0.4
67.00	70.00	0

From (m)	Sample	To (m)
37.20	415	37.78
52.05	589	52.50
68.05	1048	68.42

Fig. APP.2-3 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	20/DEC./1995 ~ 15/FEB./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	LJ-3	**Elevation**	R.L. 310.8 m	**Total Depth**	70.00 m	**Location**	JARONDI PROJECT SITE
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits				Diameter of Hole : NX (mm)	**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD [%]	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T N VALUE	U.C.S (kgf/cm²)	Remarks
1				OVERBURDEN	SOIL REDDISH BROWN SILTY CLAY AND BASALT BOULDER SOIL IS NO RECOVERED THE LENGTH OF PIECE IS 4 TO 26CM	(60) (52) (70) (62) (65) (48)		0.35 km/s	NIL	50/0 50/0 50/0			
6		304.80 6.00				(84) (92) (87) (87) (43) (75) (53) (86) (77) (82) (64) (64) (32) (32)	B				10.00		
12		298.70 12.10		COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENEOCRYSTS AND GREEN INFILLINGS	11.00 to 12.10m FROM PIECE NO.68 TO 86 CONCENTRARION OF WHITE INFILLINGS PIPE AMYGDALLS IN PIECE NO.78,81 . ETC	(85) (85) (83) (83) (87) (87) (90) (90) (89) (89) (95) (95) (84) (88) (84) (84) (91) (91) (92) (92) (89) (89) (97) (97) (78) (78) (97) (98)	A	4.50 km/s			13.00 6 16.00 3 19.00 2.3 22.00 0 25.00 0		12.95 800 13.30 24.88 781 25.20
21		290.05 20.75											

FIELD PERMEABILITY TEST (10 to 70 m)

298.70 12.10

COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENEOCRYSTS AND GREEN INFILLINGS

11.00 to 12.10m
FROM PIECE NO.68 TO 86
CONCENTRARION OF WHITE INFILLINGS
PIPE AMYGDALLS IN PIECE NO.78,81 .
ETC

290.05 20.75

PORPHYRITIC AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE GREEN INFILLINGS

40.30 to 41.70m
CONCENTRATION OF LARGE WHITE INFILLINGS FROM PIECE NO.136 TO 188

47.30 to 48.70m
CONCENTRATION OF SMALL TO LARGE WHITE INFILLINGS IN PIECE NO.203 TO 207

261.30 49.50

B

A

4.50 km/s

FIELD PERMEABILITY TEST (10 to 70 m)

10.00	6		
13.00	3	12.95	
16.00	2.3	800	
19.00	0	13.30	
22.00	0		
25.00	0	24.88	
28.00	0	781	
31.00	2.2	25.20	
34.00	1.6		
37.00	2.4	38.79	
40.00	1.3	632	
43.00	0	39.20	
46.00	0		
49.00	1.2	50.43	
		614	

PORPHYRITIC AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE GREEN INFILLINGS

40.30 to 41.70m
CONCENTRATION OF LARGE WHITE INFILLINGS FROM PIECE NO.136 TO 188

47.30 to 48.70m
CONCENTRATION OF SMALL TO LARGE WHITE INFILLINGS IN PIECE NO.203 TO 207

261.30 49.50

AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN INFILLINGS

57.45 to 58.65m
PIECE NO.225 TO 228 BROWN DUE TO HYDROTHERMAL ALTERATION
CONCENTRATION OF WHITE AMYGDALLS
PIPE AMYGDALLS IN PIECE NO.226 TO 250

MAXIMUM LENGTH OF PIECE IS 60 TO 81CM

MAXIMUM LENGTH OF PIECE IS 58 TO 87CM

240.80 70.00

A

34.00 2.2
37.00 1.6
40.00 2.4
43.00 1.3
46.00 0
49.00 0
52.00 1.2
55.00 0
58.00 0
61.00 0
64.00 0
67.00 0.3
70.00 0

38.79
632
39.20

50.43
614
50.76

68.26
484
68.65

Fig. APP.2-4 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	27/DEC./1995 ~ 13/JAN./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**UM-1**	**Elevation**	R.L. 871.092 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD [%]	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T N VALUE	U.C.S (kgf/cm²)	Remarks
1					0 to 1.5m DRY HARD GROUND SURFACE LIKE ROCK MASS	(0) (69) (0) (34)			NIL	50/0			
2													
3					1.5 to 28.00m RED LATERITE SOIL AND PARTIALLY WEATHERED BOULDER					50/0			
4						(0)							
5													
6					GENERALLY POOR RECOVERY WITH WATER FLUSH DRILLING					50/0			
7						(0)							
8													
9						(0)				50/0			
10													
11						(0)							
12										50/0			
13						(0)							
14				LATERITE			D	1.50		50/0			
15													
16						(0)				50/0			
17													
18						(0)				50/0			
19													
20						(0) (10)							
21					PARTIALLY WEATHERED ROCK PIECES								
22						(58)							
23						(50) (20)							
24													
25						(20)							
26						(0)							
27						(20)							

GENERALLY POOR RECOVERY WITH WATER FLUSH DRILLING

LATERITE

PARTIALLY WEATHERED ROCK PIECES

PORPHYRITIC BASALT (WEATHERED)

HIGHLY WEATHERED SOIL AND ROCK
ALL STAINED REDDISH BROWN

DARK GREY HARD BASALT

36.90 to 38.40m
RELATIVELY HORZL. JOINTS

42.90 to 44.40m
VERTL. JOINTS

PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS

843.09 28.00

834.19 36.90

D

1.50 km/s

D

B

4.60 km/s

?

(0) (0) (0) (0) (0) (0) (0) (0) (10) (58) (50) (20) (20) (0) (20) (20) (20) (42) (39) (85) (74) (77) (80) (50) (38) (63) (100) (100) (89) (99) (88) (100) (88) (100) (89) (100)

50/0 50/0 50/0 50/0 50/0 50/0 50/0 50/0

30.00 33.00 36.00 39.00 42.00 45.00

0.4 0.4 0 0 0 0

29.50 29.6. 30.60 30.73 33.10 33.30 39.45 39.76

FIELD PERMEABILITY TEST (30 to 60m)

843.09	28.00		PARTIALLY WEATHERED ROCK PIECES	(58) (50) (20) (20) (0) (20) (20) (42) (35) (65) (77) (77) (80) (50)			
		PORPHYRITIC BASALT (WEATHERED)	HIGHLY WEATHERED SOIL AND ROCK ALL STAINED REDDISH BROWN		D		
834.19	36.90		DARK GREY HARD BASALT 36.90 to 38.40m RELATIVELY HORZL. JOINTS	(38) (63) (100) (90) (99) (99) (88) (100) (88) (100) (89) (100) (93) (97) (83) (85) (99) (99) (92) (100)	?		
		PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS	42.90 to 44.40m VERTL. JOINTS 45.90 to 47.40m ALL JOINTS ARE STAINED		B	4.60 km/s	
819.49	51.60	VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	SOFT ROCK CONDITIONS SOME PIECES ARE WAX COATED	(20) (100) (0) (100)	C		
816.59	54.50	PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINEGS	DARK GREY HARD BASALT LENGTH OF PIECE (10 TO 48CM) HORZL., OR VERTL., JOINTS	(100) (100) (85) (100) (71) (100) (100) (100) (100)	B		
811.09	60.00						

30.00	0.4			
33.00	0.4			
36.00	0			
39.00	0			
42.00	0			
45.00	0			
48.00	0			
51.00	0			
54.00	0			
57.00	0			
60.00				

FIELD PERMEABILITY TEST (30 to 60m)

29.50	29.51	
30.50	30.73	
33.10	33.30	
39.45	513	39.76
47.79	349	48.03
52.29	312	52.50
55.75	437	56.08
58.99	457	59.70

Fig. APP.2-5 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	14/DEC./1995 ~ 4/JAN./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**UM-2**	**Elevation**	R.L. 826 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery — x — (%) / RQD (%)	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T N VALUE	U.C.S (kgf/cm²)	Remarks
1				RIVER DEPOSIT	BASALT BOULDER AND SAND	(25) (10) (50) (0) (20)					52		
2													
3													
4													
5													
6	820.00	6.00						0.30 km/s			22		
7						(14)							
8						(18)							
9				PORPHYRITIC BASALT (WEATHERED)	HIGHLY WEATHERED CONDITIONS POOR RECOVERY PARTIALLY SMALL PIECES OBTAINED	(52)			D		20		
10						(53)							
11						(34)					50/20		
12	814.10	11.90						?			12.00		
13					GREY HARD BASALT METAL SOUND BY HAMMER BLOW	(81) (100)					0		
14					13.72 to 15.05m ALL JOINTS ARE STAINED	(92) (100)							
15											15.00		
16					LENGTH OF PIECE (11 TO 55CM) ANGLE OF JOINT (HORZL, 80)	(91) (100)					0.1		16.59 618 17.06
17						(88) (89)							
18											18.00		
19						(70) (99)					0.3		
20						(91) (100)		4.60 km/s					
21											21.00		
22						(93) (100)							22.10 218 22.80
23					LENGTH OF PIECE (17 to 83CM)	(86) (100)					0		
24						(86) (100)					24.00		
25				PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS		(100) (100)			E		0		
26						(80) (100)							
27											27.00		
28						(97) (97)							

FIELD PERMEABILITY TEST (12 to 60m)

820.00	6.00	PORPHYRITIC BASALT (WEATHERED)	HIGHLY WEATHERED CONDITIONS POOR RECOVERY PARTIALLY SMALL PIECES OBTAINED	(0) (20) (14) (38) (52) (53) (34)	0.30 km/s	D
814.10	11.90		GREY HARD BASALT METAL SOUND BY HAMMER BLOW	(81) (100) (100)	?	
			13.72 to 15.05m ALL JOINTS ARE STAINED	(92) (100)		
			LENGTH OF PIECE (11 TO 55CM) ANGLE OF JOINT (HORZL, 80)	(97) (100) (88) (89) (70) (99) (91) (100)	4.60 km/s	
		PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS	LENGTH OF PIECE (17 to 83CM)	(93) (100) (86) (100) (86) (100) (100) (100)		B
			ANGLE OF JOINT (VARIOUS) LENGTH OF PIECE (11 TO 40CM)	(80) (100) (97) (97) (92) (100) (96) (100) (97) (97)		
			ANGLE OF JOINT (HORZL, VERTL.)	(100) (88) (100) (100) (100) (87) (100) (74) (100)		
786.93	39.07	VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	FRAGMENT CAUGHT UP IN HYDROTHERMALLY ALTERED RED TACHLYTIC BASALTIC LAVA MATRIX GENERALLY SOFT ROCK ARE WAX COATED EASY BROKEN WITH HAND	(0) (100) (0) (100) (0) (100) (0) (100)		C

22					
20					
50/20					
12.00					
	0				
15.00					
	0.1				
18.00					
	0.3				
21.00					
	0				
24.00					
	0				
27.00					
	0				
30.00					
	0				
33.00					
	0				
36.00					
	0.2				
39.00					
	0				
42.00					
	0				
45.00					

FIELD PERMEABILITY TEST (12 to 60m)

16.59	618	17.06
22.10	844	22.30
32.07	976	32.47
39.15	839	39.40

24			PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS		(86) (100)	B	24.00		
25					(100) (100)				
26							0		
27					(80) (100)		27.00		
28					(97) (97)				
29							0		
30				ANGLE OF JOINT (VARIOUS) LENGTH OF PIECE (11 TO 40CM)	(92) (100)		30.00		
31					(96) (100)				
32							0	32.07 976 32.47	
33					(97) (97)		33.00		
34					(100) (100)				
35							0		
36					(88) (100)		36.00		
37				ANGLE OF JOINT (HORZL., VERTL.)	(100) (100)				
38					(87) (100)		0.2		
39	786.93	39.07			(74) (100)		39.00	39.15 839 39.40	
40					(0) (100)				
41							0		
42			VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	FRAGMENT CAUGHT UP IN HYDROTHERMALLY ALTERED RED TACHLYTIC BASALTIC LAVA MATRIX GENERALLY SOFT ROCK ARE WAX COATED EASY BROKEN WITH HAND	(0) (100)		42.00		
43					(0) (100)	C			
44							0		
45					(0) (100)		45.00		
46					(0) (100)				
47	778.65	47.35					0		
48				GREY HARD BASALT METAL SOUND BY HAMMER BLOW	(90) (100)		48.00		
49								48.80 954 49.90	
50				ANGLE OF JOINT (45, 80 TO VERTL.)	(89) (100)		0		
51					(98) (98)		51.00		
52					(98) (100)		0	52.46 1092 52.71	
53			COMPACT PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS	LENGTH OF PIECE (10 TO 59CM)		B			
54					(99) (99)		54.00		
55							0		
56				ANGLE OF JOINT (VARIOUS)	(99) (99)			55.82 878 56.04	
57					(98) (99)		57.00	57.33 1269 57.60	
58					(100) (100)		0		
59									
60	765.00	60.00			(100) (100)		60.00		

Fig. APP.2-6 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	20/DEC./1995 ~ 9/JAN./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**UM-3**	**Elevation**	R.L. 871 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) / RQD [%] (0 50 100)	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE (0 10 20) / S.P.T N VALUE (0 10 20 30 40 50)	U.C.S (kgf/cm²)	Remarks
1					0 to 2.5m DRY HARD GROUND SURFACE LIKE ROCK MASS	(57)			Nil				
2						(53)							
3					2.5 to 30.65m RED LATERITE SOIL AND PARTIALLY WEATHERED BOULDER								
4						(10)							
5						(5)							
6					GENERALLY POOR RECOVERY WITH WATER FLUSH DRILLING						50/0		
7						(6)							
8						(14)							
9						(20)							
10						(0)							
11						(0)					50/2		
12						(6)							
13						(33)							
14													
15					LATERITE	(0)	D	1.50 km/s					
16											12		
17						(0)					8		
18						(0)					31		
19											18		
20						(0)							
21						(0)					23		
22											29		
23					CORE RECOVERY GRADUALLY INCREASE 23M TO BOTTOM HIGHLY WEATHERED SMALL PIECES	(0)					29		
24						(44)							
25													
26						(44)							
27						(80)							

RED LATERITE SOIL AND PARTIALLY WEATHERED BOULDER

GENERALLY POOR RECOVERY WITH WATER FLUSH DRILLING

LATERITE

CORE RECOVERY GRADUALLY INCREASE 23M TO BOTTOM
HIGHLY WEATHERED SMALL PIECES

840.35 30.65

30.65 to 32.15m
CLOSELY JOINT SPACING SLIGHTLY WEATHERED

838.85 32.15

GENERALLY GREY HARD BASALT

METAL SOUND BY HAMMER BLOW

ANGLE OF JOINT
(30,45,HORZL.)

36.65 to 37.65m
CLOSELY JOINT SPACING

PORPHYRITIC AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN INFILLINGS

ANGLE OF JOINT
(45, VERTL.)

(10) (5) (6) (14) (20) (0) (0) (6) (33) (0) (0) (0) (0) (0) (0) (44) (44) (80) (90) (50) (61) (95) (95) (88) (100) (94) (94) (41) (74) (97) (97) (68) (91) (81) (88) (100) (100) (89) (85)

D 1.50 km/s

C

B

50/0 50/2 12 8 31 18 23 29 29

30.00 0.8 33.00 0 36.00 0 39.00 0 42.00 0 45.00

FIELD PERMEABILITY TEST (30 to 60m)

33.29 571 33.65
37.84 1026 38.33
41.91 523 42.13
43.76 856 44.21

INCREASE 23M TO BOTTOM
HIGHLY WEATHERED SMALL PIECES

840.35 30.65

30.65 to 32.15m
CLOSELY JOINT SPACING SLIGHTLY WEATHERED

GENERALLY GREY HARD BASALT

METAL SOUND BY HAMMER BLOW

ANGLE OF JOINT
(30,45,HORZL.)

838.85 32.15

36.65 to 37.65m
CLOSELY JOINT SPACING

PORPHYRITIC AMYGDALOIDAL BASALT WITH SMALL TO LARGE GREEN INFILLINGS

ANGLE OF JOINT
(45, VERTL.)

824.49 46.51

VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)

LONG PIECES ARE OBTAINED BUT BROKEN BY HAND EASILY

821.52 49.48

GENERALLY GREY HARD BASALT

METAL SOUND BY HAMMER BLOW

LENGTH OF PIECE
(10 TO 50CM)

ANGLE OF JOINT
(45, VERTL.)

POROHYRITIC AMYGDALODAL BASALT WITH SMALL TO LARGE GREEN INFILLINGS

57.2 to bottom
VERTL. JOINTS

811.00 60.00

C
B
C
B

30.00
0.8
33.00
0
36.00
0
39.00
0
42.00
0
45.00
0
48.00
0
51.00
0
54.00
0
57.00
0
60.00

FIELD PERMEABILITY TEST (30 to 60m)

33.29
571
33.85
37.84
1026
38.33
41.91
542
42.13
43.76
356
44.21
48.15
527
48.46
51.20
537
51.67
55.70
393
56.05
59.80
674
60.00

Fig. APP.2-7 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA							
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	29/NOV./1995 ~ 8/DEC./1995			
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD			
B.H.No.	UM-4	**Elevation**	R.L. 849.195 m	**Total Depth**	30.00 m	**Location**	MARLESHWAR PROJECT SITE	
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF	

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD ⌐¬ (%)	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T N VALUE	U.C.S (kgf/cm²)	Remarks
1					RED LATERITE SOIL	(0)			NIL	7			
2					PARTIALLY HIGHLY WEATHERED SMALL PIECES	(0)		0.40 km/s		16			
3													
4						(0)				50		4.57 4.68	
5					GENERALLY POOR CORE RECOVERY WITH WATER FLUSH DRILLING	(27)							
6										32			
7						(0)							
8													
9						(0)				30			
10						(0)				17			
11				LATERITE		(0)	D	1.50 km/s					
12										17			
13						(0)				15			
14						(0)							
15						(0)				20			
16													
17					SMALL WETHERED PIECES	(39)							
18						(38)							
19						(38) (59)							
20						(21)							
21													
22	826.69	22.50				(22)							
23					THE ROCK IS IN BROKEN AND WEATHERED CONDITION	(22)							
24					POOR CORE RECOVERY	(44)							

Scale in m	Elevation in m	Depth in m	Type of Rock	Description	Core Recovery —x— (%) RQD ⌐ (%)	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T N VALUE	U.C.S (kgf/cm²)	Remarks
1				RED LATERITE SOIL	(0)			Nil	7			
2				PARTIALLY HIGHLY WEATHERED SMALL PIECES	(0)		0.40 km/s		16			
3												
4					(0)				50		4.57 4.68	
5				GENERALLY POOR CORE RECOVERY WITH WATER FLUSH DRILLING	(27)							
6									32			
7					(0)							
8												
9					(0)							
10					(0)							
11			LATERITE		(0)	D						
12							1.50 km/s		30			
13					(0)							
14									17			
15					(0)				17			
16												
17				SMALL WETHERED PIECES	(0)				15			
18					(39)							
19					(38)				20			
20					(38)							
21					(59)							
22					(21)							
	826.69	22.50			(22)							
23				THE ROCK IS IN BROKEN AND WEATHERED CONDITION	(22)							
24				POOR CORE RECOVERY	(44)	D						
25			PORPHYRITIC BASALT (WEATHERED)	SMALL PIECES (2 TO 7CM) 24.65 to 26.15m PIECE NO.86,89,90,98,99,102,103 NO.OF SMALL PCS	(42)	≀ C						
26												
27					(77) (87)							
	821.24	27.95										
28			PORPHYRITIC BASALT WITH SMALL TO LARGE INFILLINGS	DARK GREY HARD BASALT	(90) (100)	B					29.75 38.8 30.00	
29				LENGTH OF PIECE (10 TO 28CM)								
	819.19	30.00			(85) (87)							
30												

Fig. APP.2-8 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	29/NOV./1995 ~ 9/DEC./1995		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	UM-5	**Elevation**	R.L. 874.221 m	**Total Depth**	30.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD [%]	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T N VALUE	U.C.S (kgf/cm²)	Remarks
1						(12) (0)		0.35 km/s	NIL	50			
2						(13)							
3													
4						(15)							
5													
6						(28)						5.90 / 6.15	
7													
8						(16)							
9					RED LATERITE SOIL PARTIALLY HIGHLY WEATHEREED SMALL PIECES	(0)	D						
10				LATERITE						32			
11					POOR CORE RECOVERY	(20)		1.20 km/s					
12						(34)							
13													
14						(54)							
15						(0)							
16										6			
17						(0)							
18										8			
19						(58)							
	854.72	19.50											
20				PORPHYRITIC BASALT (WEATHERED)	THE ROCK IS BROKEN AND WEATHERED CONDITION	(29)	D ~ C						
21					POOR CORE RECOVERY	(55)							
22	852.22	22.00											
23					DARK GREY HARD BASALT	(30)							
24					CORE RECOVERY IS POOR BECAUSE OF PARTIAL CLOSELY JOINT SPACING	(51)							
25				PORPHYRITIC BASALT WITH SMALL TO LARGE			C	km/s					

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Recovery —×— (%) RQD ⌐ (%) 0 50 100	Rock Classificat	VP (km/s)	Water Table	N-Value	LUGEON VALUE 0 10 20 / S.P.T N VALUE 0 10 20 30 40 50	U.C.S (kgf/cm	Remarks
1						(12)		0.35 km/s	NIL	50			
2						(0)							
3						(13)							
4						(15)							
5													
6						(26)						5.90 / 1.96 / 6.15	
7													
8						(16)							
9					RED LATERITE SOIL PARTIALLY HIGHLY WEATHEREED SMALL PIECES	(0)	D						
10				LATERITE						32			
11					POOR CORE RECOVERY	(20)		1.20 km/s					
12						(34)							
13													
14						(54)							
15						(0)							
16										6			
17						(0)							
18										8			
19						(58)							
20	854.72	19.50		PORPHYRITIC BASALT (WEATHERED)	THE ROCK IS BROKEN AND WEATHERED CONDITION	(29)	D ~ C						
21					POOR CORE RECOVERY	(55)							
22	852.22	22.00			DARK GREY HARD BASALT								
23						(30)							
24					CORE RECOVERY IS POOR BECAUSE OF PARTIAL CLOSELY JOINT SPACING	(51)							
25				PORPHYRITIC BASALT WITH SMALL TO LARGE INFILLINGS									
26						(39) (39)	C ~ B	4.00 km/s					
27						(71) (78)						26.99 / 4.73 / 27.27	
28												28.27 / 1.83 / 28.44	
29						(70) (76)							
30	844.22	30.00				(73) (73)							