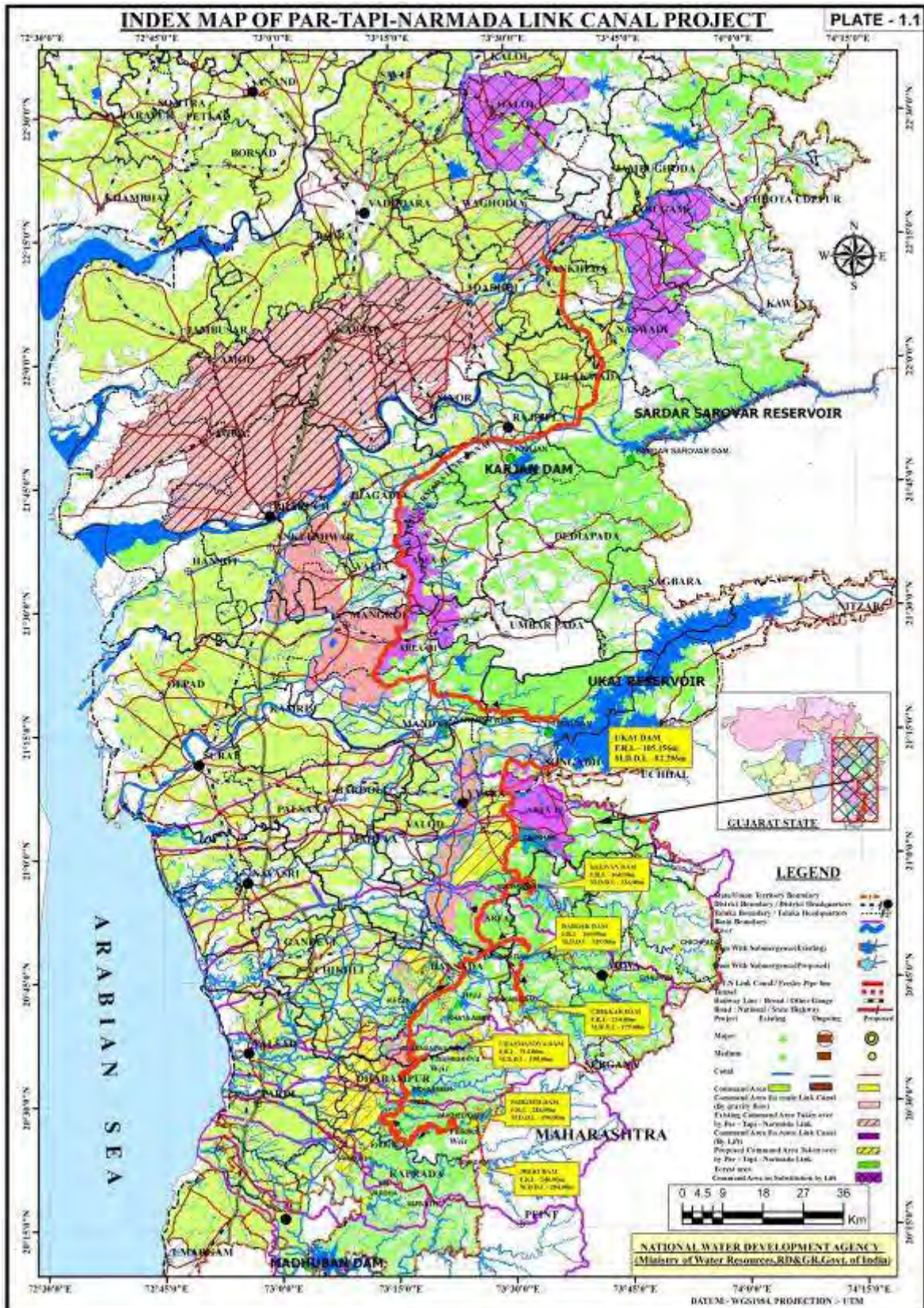


PAR – TAPI - NARMADA LINK PROJECT

ANNEXURE-I

PROJECT INDEX MAP



PAR – TAPI - NARMADA LINK PROJECT

ANNEXURE-II

Land to be acquired under Reservoir Submergence of Various Dams

Dam site	Submergence Area (ha)			
	Forest Land	Culturable and Other Land	River Portion	Total
Jheri	408	256	172	836
Paikhed	317	589	88	994
Chasmandva	300	255	60	615
Chikkar	300	332	110	742
Dabdar	614	482	153	1249
Kelwan	890	450	289	1629
Total	2829	2364	872	6065

Details of Land to be Acquired for Link Canal and Feeder Pipe lines

Link	Details of Land (ha)				
	Forest Land	Culturable Land	Uncultivable Land	River Portion	Total
Par- Tapi	964.30	855.00	133.80	26.60	1979.70
Tapi-Narmada	402.00	1457.70	188.50	60.10	2108.30
Feeder Pipe lines	244.10	152.60	0.90	9.10	406.70
Total	1610.40	2465.30	323.20	95.80	4494.70

Land to be acquired for Par -Tapi - Narmada Link Project

Dam site	Area (ha)
Reservoir Submergence of Various Dams	6065.00
Link Canal and Feeder Pipe lines	4494.70
Total	10559.7

PAR – TAPI - NARMADA LINK PROJECT

ANNEXURE-III

Salient Features Par-Tapi-Narmada Link Project

Sl. No.	Particulars			
1	Name of the Project	Par-Tapi-Narmada Link Project		
2	Type of Project (Irrigation or Multipurpose)	Multipurpose		
3	Location	Maharashtra and Gujarat		
3.1	River Basin			
a)	Name	Par, Auranga, Ambica, Purna, Mindhola, Tapi, Kim and Narmada		
b)	Located in			
i)	State(s)	Gujarat and Maharashtra		
3.2	River / Tributary	Par/Aroti, Nar, Bhimtas, Vajra and Keng Auranga/Man and Tan, Ambica/Khapri, Olan, Kaveri and Kharera, Purna/Girra, Zankhari and Damas khadi		
3.3	State(s)/District(s)/ Taluka(s) in which the following are located:			
a)	Reservoirs	State	District	Taluka
(i)	Jheri Dam	Maharashtra	Nasik	Peint
(ii)	Paikhed Dam	Gujarat / Maharashtra	Valsad/Nasik	Dharampur/ Surgana
(iii)	Chasmandva Dam	Gujarat / Maharashtra	Valsad/Nasik	Dharampur/ Surgana
(iv)	Chikkar Dam	Gujarat	Dang	Ahwa
(v)	Dabdar Dam	Gujarat	Dang	Ahwa
(vi)	Kelwan Dam	Gujarat	Dang	Ahwa
b)	Head work	State	District	Taluka
(i)	Jheri Dam	Maharashtra	Nasik	Peint
(ii)	(a) Paikhed Dam	Gujarat	Valsad	Dharampur
(b)	Paikhed barrage	Gujarat	Valsad	Dharampur
(iii)	(a) Chasmandva Dam	Gujarat	Valsad	Dharampur
(b)	Chasmandva barrage	Gujarat	Valsad	Dharampur
(iv)	Chikkar Dam	Gujarat	Dang	Ahwa
(v)	Dabdar Dam	Gujarat	Dang	Ahwa
(vi)	Kelwan Dam	Gujarat	Dang	Ahwa
c)	Command Area	State	District	Taluka
1.	Enroute command area	Gujarat	Dang	Ahwa
			Bharuch	Ankleshwar, Valia Jhagadia
			Navsari	Vansda
			Surat	Mangrol, Mahuva, Mandvi
			Tapi	Vyara
			Valsad	Dharampur
2.	Projects proposed by Government of Gujarat	Gujarat	Navsari	Vansda, Chikhali Khergam
			Valsad	Kaprada, Valsad, Dharampur
			Tapi	Vyara, Songadh

PAR – TAPI - NARMADA LINK PROJECT

			Surat	Mahuva
3.	Right side command area by lift	Gujarat	Tapi	Vyara
			Tapi	Songadh
			Surat	Mangrol, Umarpada
			Bharuch	Jhagadia, Valia
4.	Command area in the vicinity of proposed reservoirs by lift	Maharashtra	Nasik	Surgana, Peint
		Gujarat	Navsari	Vansada
			Valsad	Dharampur
			Dang	Ahwa, Waghai Subir
5.	Taken over command			
	1. Chhota Udepur	Gujarat	Chhota Udepur	Jetpur Pavi, Sankheda, Nasvadi, Kavant, Bodeli, Chhota Udepur
	2. Panchmahal	Gujarat	Panchmahal	Halol, Kalol, Ghoghamba
	3. Saurashtra Region	Saurashtra Region		
d)	Power house	State	District	Taluka
	(i) Paikhed Dam	Gujarat	Valsad	Dharampur
	(ii) Chasmandva Dam	Gujarat	Valsad	Dharampur
	(iii) Chikkar Dam	Gujarat	Dang	Ahwa
	(iv) Dabdar Dam	Gujarat	Dang	Ahwa
	(v) Kelwan Dam	Gujarat	Dang	Ahwa
	(vi) Kelwan Feeder Pipe line	Gujarat	Dang	Ahwa
3.4	Name of village near Head works	Name of the village		
	(i) Jheri Dam	Jheri /Behadpada		
	(ii) Paikhed Dam	Paikhed/Tutarkhed		
	Paikhed barrage	Nanicoswadi		
	(iii) Chasmandva Dam	Chasmandva		
	Chasmandva barrage	Chondha Chikadi		
	(iv) Chikkar Dam	Chikkar		
	(v) Dabdar Dam	Dabdar		
	(vi) Kelwan Dam	Kelwan		
3.5	Location of Head works	Latitude (N)	Longitude (E)	
	(i) Jheri Dam	20° 22' 25"	73° 25' 51"	
	(ii) (a) Paikhed Dam	20° 27' 42"	73° 23' 37"	
	(b) Paikhed barrage	20° 27' 11"	73° 22' 30"	
	(iii) (a) Chasmandva Dam	20° 37' 02"	73° 22' 36"	
	(b) Chasmandva barrage	20° 36' 05"	73° 18' 50"	
	(iv) Chikkar Dam	20° 42' 00"	73° 30' 50"	
	(v) Dabdar Dam	20° 48' 58"	73° 32' 05"	
	(vi) Kelwan Dam	20° 55' 30 "	73° 32' 00"	
c)	Lies in Earthquake Zone No.	The project sites lie in seismic Zone-III as per the zoning map of India (IS: 1893-2002, Part-1).		

PAR – TAPI - NARMADA LINK PROJECT

3.6 Project area reference to:					
a)	Survey of India Topo-sheets-1:50,000 Scale	46 F/12 46G / 2, 3, 5, 6, 7, 8, 9, 11, 12 46H / 2, 3, 5, 6, 7, 9, 10			
b)	Index Plan	Plate: 1.1			
3.7 Access to the project		Name	Distance from project site		
a)	Airport	Mumbai/ Surat	170 km to 300 km		
b)	Rail head	Valsad/Surat on WR	90 km to 100 km		
c)	Road head	Valsad/ Surat West side of NH-8	80 km to 95 km		
d)	River port	Hazira	100 km to 150 km		
e)	Seaport	Mumbai	170 km to 300 km		
4 Inter State aspects of the project					
a)	Catchment area of the basin				
1)	State-wise details of catchment area	Maharashtra (km²)	Gujarat (km²)	Total (km²)	
	(i) Par Basin	773	875	1648	
	(ii) Auranga Basin	150	598	748	
	(iii) Ambica Basin	102	2583	2685	
	(iv) Purna Basin	58	2135	2193	
b)	State-wise details of catchment area up to diversion dam	Maharashtra (km²)	Gujarat (km²)	Total (km²)	
	(i) Jheri Dam-Par river	425	-	425	
	(ii) Paikhed-Nar river	269	46	315	
	(iii) Chasmandva- Auranga river	62	27	89	
	(iv) Chikkar-Ambica River	102	202	304	
	(v) Dabdar-Khapri River	-	457	457	
	(vi) Kelwan-Purna River	-	694	694	
c)	1.Submergence due to projects (ha)-State wise	Maharashtra (ha)	Gujarat (ha)	Total (ha)	
	(i) Jheri Dam	836	--	836	
	(ii) Paikhed	100	894	994	
	(iii) Chasmandva	32	583	615	
	(iv) Chikkar	--	742	742	
	(v) Dabdar	--	1249	1249	
	(vi) Kelwan	--	1629	1629	
	Total	968	5097	6065	
	2.Submergence due to projects (ha) & Land use / Land cover	Forest (ha)	Culturable land(ha)	River bed (ha)	Total (ha)
	(i) Jheri Dam	408	256	172	836
	(ii) Paikhed	317	589	88	994
	(iii) Chasmandva	300	255	60	615
	(iv) Chikkar	300	332	110	742
	(v) Dabdar	614	482	153	1249
	(vi) Kelwan	890	450	289	1629
	Total	2829	2364	872	6065
d)	Water allocation for the State (if any) / country	Water sharing between the States of Gujarat and Maharashtra is under finalisation			
e)	Committed	Jheri (MCM)		Paikhed (MCM)	

PAR – TAPI - NARMADA LINK PROJECT

utilisation											
	Upstream Projects	Irrigation	Water supply	Industrial	Hydel	Envr. &Eco	Irrigation	Water supply	Industrial	Hydel	Envr. & Eco
i)	Projects completed	6.49	--	--	--	--	1.61	--	--	-	--
ii)	Projects under construction	1.58	--	--	--	--	--	--	--	-	--
iii)	Future projects	11.09	1.30	3.94	--	--	11.32	1.83	3.99	--	3.06
iv)	Any other	--	--	--	--	--	--	--	--	--	--
	Downstream Projects										
i)	Projects completed	--	--	--	--	--	--	--	--	--	--
ii)	Projects under construction	--	--	--	--	--	--	--	--	--	--
iii)	Future projects	--	--	--	--	--	--	--	--	--	--
iv)	Any other	--	--	--	--	--	--	--	--	--	--
	Sub-total	19.16	1.30	3.94	--	--	12.93	1.83	3.99	--	3.06
	Committed utilisation	Chasmandva (MCM)					Chikkar (MCM)				
	Upstream Projects	Irrigation	Water supply	Industrial	Hydel	Envr. &Eco	Irrigation	Water supply	Industrial	Hydel	Envr. & Eco
i)	Projects completed	--	--	--	--	--	--	--	--	--	--
ii)	Projects under construction	--	--	--	--	--	--	--	--	--	--
iii)	Future projects	5.88	0.27	0.85	--	0.59	52.79	0.64	2.20	--	2.42
	Downstream Projects										
i)	Projects completed	--	--	--	--	--	--	--	--	--	--
ii)	Projects under construction	--	--	--	--	--	--	--	--	--	--
iii)	Future projects	--	--	--	--	--	--	--	--	--	--
iv)	Any other	--	--	--	--	--	--	--	--	--	--
	Sub-total	5.88	0.27	0.85	--	0.59	52.79	0.64	2.20	--	2.42
	Committed utilisation	Dabdar (MCM)					Kelwan (MCM)				
	Upstream Projects	Irrigation	Water supply	Industrial	Hydel	Envr. &Eco	Irrigation	Water supply	Industrial	Hydel	Envr. & Eco
i)	Projects completed	--	--	--	--	--	--	--	--	--	--
ii)	Projects under construction	--	--	--	--	--	--	--	--	--	--
iii)	Future projects	61.54	3.88	5.53	--	3.93	52.47	5.22	7.53	--	4.1

PAR – TAPI - NARMADA LINK PROJECT

											0	
iv)	Any other	--	--	--	--	--	--	--	--	--	--	
	Downstream Projects											
i)	Projects completed	--	--	--	--	--	--	--	--	--	--	
ii)	Projects under construction	--	--	--	--	--	--	--	--	--	--	
iii)	Future projects	--	--	--	--	--	--	--	--	--	--	
iv)	Any other	--	--	--	--	--	--	--	--	--	--	
	Sub-total	61.54	3.88	5.53	--	3.93	52.47	5.22	7.53	--	4.10	
f)	Proposed annual utilisation(net consumptive) by the project (MCM)		Jheri	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan				
i)	Irrigation		19.16	12.93	5.8	50.29	58.67	52.47				
ii)	Hydel (evaporation losses) (MCM)		nil	nil	nil	nil	nil	nil				
iii)	Thermal Power (MCM)		nil	nil	nil	nil	nil	nil				
iv)	Local Domestic and Industrial (MCM)		1.05	1.17	0.22	0.57	1.89	2.55				
v)	Gross annual utilisation (MCM) (sum of i to v)		20.21	14.10	6.02	50.86	60.56	55.02				
g)	Minimum agreed / proposed flow in the river for maintaining ecology		0.00	3.06	0.59	2.42	3.93	4.10				
5	Estimated life of the projects (years)	100 years										
6	Irrigation (ha)	The project will provide annual irrigation to 2.32 lakh hectare area in En-route and drought prone Saurashtra and Kutch area as detailed below:										
		Command					CCA (ha)	Annual Irrigation(ha)				
	a. En-route command											
	(i) From Main canal						59920	5992				
	(ii) From feeder pipe line						1270	127				
	b. Project proposed by Government of Gujrat on the left side of canal						45561	4556				
	c. Tribal area in enroute right of canal						36200	3620				
	d. Tribal area in vicinity of reservoirs						12514	1251				
	e. Tribal areas on right side of Narmada main canal by lift						34342	3434				
	f. Target command in drought prone Saurashtra and Kutch region						42368	4236				
	Grand Total						232175	23217				
		Say 2.32 lakh ha										
7	Flood control	No flood control envisaged										
8	Navigation	No navigation proposed										

PAR – TAPI - NARMADA LINK PROJECT

9	Water supply						
9.1	Domestic and Industrial						
a)	Names of towns / villages/ Industries served	Local domestic and industrial demands considered in the vicinity of project area.					
b)	Size of population served	Villages in the vicinity of the dam sites					
c)	Quantum of water made available (MCM)	126 MCM (76 MCM for drinking + 50 MCM for filling tanks)					
d)	Quantum of water per capita (liter)	70/135					
10	Project performance	Jheri			Paikhed		
		Period of simulation	No. of failure	Period of simulation	No. of failure		
a)	Irrigation	32	--	32	--		
b)	Power	32	--	32	--		
c)	Flood control	Not applicable			Not applicable		
d)	Water supply	32	--	32	--		
e)	Navigation	Not applicable			Not applicable		
		Chasmandva			Chikkar		
a)	Irrigation	32	--	32	--		
b)	Power	32	--	32	--		
c)	Flood control	Not applicable			Not applicable		
d)	Water supply	32		32			
e)	Navigation	Not applicable			Not applicable		
		Dabdar			Kelwan		
a)	Irrigation	32	--	32	--		
b)	Power	32	--	32	--		
c)	Flood control	Not applicable			Not applicable		
d)	Water supply	32		32			
e)	Navigation	Not applicable			Not applicable		
11	Hydrology						
11.1	Catchments						
11.1.1	Catchments area at headwork site km²	Jheri	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan
a)	Gross	425	315	89	323	482	733
b)	Intercepted						
i)	By existing projects	5.83	1.34	-	-	-	-
ii)	By ongoing projects	2.55	-	-	-	-	-
iii)	By contemplated projects	17.90	18.27	8.16	44.3	58.26	53.98
c)	Un-intercepted	398.72	331.93	80.84	278.7	398.74	640.02
11.1.2	Catchment area classification according to mode of precipitation	(a) Rain-fed (km²)			(b) Snow-fed (km²)		
	(i) Jheri Dam	425			Nil		
	(ii) Paikhed	315			Nil		
	(iii)Chasmandva	89			Nil		
	(iv)Chikkar	323			Nil		
	(v)Dabdar	482			Nil		
	(vi)Kelwan	733			Nil		
11.2	Precipitation(mm)						
11.2.1	Catchments	Annual rainfall				Annual Snowfa	

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					II
		(a) Average	(b) Maximum	(c) Minimum	
	(i) Par	2180	2669	1920	Nil
	(ii) Auranga	2050	2406	1644	Nil
	(iii) Ambica	1830	2520	1419	Nil
	(iv) Purna	1472	1972	782	Nil
11.2.2	Command Area: Command area lies in the following basins	Mean annual rainfall			
	(i) Ambica and Purna	2528.5			
	(ii) Tapi	894.4			
	(iii) Narmada	1107.3			
11.3	Annual yield calculated at the proposed site (MCM)				
		Jheri		Paikhed	
		Gross	Net	Gross	Net
a)	Average yield	528	508.70	380	366.60
b)	At 50% dependability	467	446.30	335	320.80
c)	At 75% dependability	391	371.10	264	249.90
d)	At 100% dependability	183	173.60	152	144.10
		Chasmandva		Chikkar	
		Gross	Net	Gross	Net
a)	Average yield	102	96.10	304	254.70
b)	At 50% dependability	91	84.90	257	206.20
c)	At 75% dependability	70	64.00	220	169.70
d)	At 100% dependability	41	37.40	139	107.10
		Dabdar		Kelwan	
		Gross	Net	Gross	Net
a)	Average yield	488	429.90	497	443.50
b)	At 50% dependability	455	394.20	445	390.30
c)	At 75% dependability	323	262.00	362	307.60
d)	At 100% dependability	150	122.00	252	214.10
11.4	Climatic Data (command)	Surat station		Vadodara station	
	IMD Stations in the command area				
		Max	Min	Max	Min
	Temperature (°C)	36.80	14.70	39.90	13.20
	Relative Humidity (%)	90.00	53.00	94.00	44.00
	Wind Speed (km/h)	6.40	1.70	13.30	2.20
	Cloud Cover (Oktas)	6.2	0.70	6.4	0.80
11.5	Seismic coefficients	Jheri		Paikhed	
		Concrete	Earthen	Concrete	Earthen
a)	Horizontal	0.090	0.017	0.086	0.024
b)	Vertical	0.085	0.012	0.078	0.017
		Chasmandva		Chikkar	
		Concrete	Earthen	Concrete	Earthen
a)	Horizontal	0.088	0.028	0.082	0.023
b)	Vertical	0.083	0.020	0.076	0.016
	Seismic coefficients	Dabdar		Kelwan	
		Concrete	Earthen	Concrete	Earthen

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a)	Horizontal	0.097	0.028	0.097	0.029
b)	Vertical	0.091	0.019	0.091	0.020
11.6	Utilisation within the State (MCM)	1330 MCM (PTN link canal requirement:1210 MCM ; Environmental releases d/s of proposed dam sites: 20 MCM ; Drinking water and filling of tanks requirement in the vicinity of proposed reservoirs: 60 MCM; and evaporation losses proposed in the reservoir: 40 MCM in Gujarat State			
11.6.1	Water availability (State's share in case of inter State river)	Water sharing between the States of Gujarat and Maharashtra is under finalisation			
11.6.2	Committed utilisation	Jheri Dam (MCM)		Paikhed Dam (MCM)	
		Major & Medium	Minor	Major & Medium	Minor
a)	Upstream Projects				
i)	Projects completed	-	6.49		1.61
ii)	Projects under construction	-	1.58	-	-
iii)	Future projects	-	11.09		11.32
iv)	Any other	-	-	-	-
b)	Downstream Projects	-			
i)	Projects completed	-	-	-	-
ii)	Projects under construction	-	-	-	-
iii)	Future projects	-	-	-	-
iv)	Any other	-	-	-	-
		Chasmandva Dam (MCM)		Chikkar Dam (MCM)	
		Major & Medium	Minor	Major & Medium	Minor
a)	Upstream Projects				
i)	Projects completed	-	-	-	-
ii)	Projects under construction	-	-	-	-
iii)	Future projects	-	5.8	30.05	22.74
iv)	Any other	-	-	-	-
b)	Downstream Projects	-	-	-	-
i)	Projects completed	-	-	-	-
ii)	Projects under construction	-	-	-	-
iii)	Future projects	-	-	-	-
iv)	Any other	-	-	-	-
	Committed utilisation	Dabdar Dam (MCM)		Kelwan Dam (MCM)	
		Major & Medium	Minor	Major & Medium	Minor
a)	Upstream Projects	-	-	-	-
i)	Projects completed	-	-	-	-
ii)	Projects under construction	-	-	-	-
iii)	Future projects	34.43	27.11	-	52.47
iv)	Any other	-	-	-	-
b)	Downstream Projects	-	-	-	-
i)	Projects completed	-	-	-	-
ii)	Projects under construction	-	-	-	-
iii)	Future projects	-	-	-	-

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iv)	Any other	-	-	-	-	-	-
11.6.3	Proposed utilisation by the project	(a) Irrigation (MCM)		(b) Water supply (MCM)			
	(i)Jheri Dam	0.00		10.00			
	(ii)Paikhed Dam	0.00		10.00			
	(iii)Chasmandva Dam	0.00		10.00			
	(iv)Chikkar Dam	0.00		10.00			
	(v)Dabdar Dam	5.00		10.00			
	(vi)Kelwan Dam	5.00		10.00			
		10.00		60.00			
11.7	Floods near the headwork site						
11.7.1	Observed period of record	(a) Maximum water level (El-m)		(b)Maximum discharge estimated (Cumec)		(c)Year of occurrence, date	
	(i)Jheri Dam	NA		NA		NA	
	(ii)Paikhed Dam	NA		NA		NA	
	(iii)Chasmandva Dam	NA		NA		NA	
	(iv)Chikkar Dam	NA		NA		NA	
	(v)Dabdar Dam	NA		NA		NA	
	(vi)Kelwan Dam	NA		NA		NA	
11.7.2	Estimated Flood - Magnitude (Cumec) /Dams	Jheri	Paikhed	Chasmandva	Chikkar	Dabdar	Kelwan
a)	50 year return period diversion flood (Cumec)	2703	2017	1024	2167	2539	3102
b)	100 year return period diversion flood (Cumec)	2989	2211	1065	2374	2796	3428
c)	Standard project flood	NA	NA	NA	NA	NA	NA
d)	Maximum probable flood (Cumec)	6539	5307	2578	5649	6683	7979
	Barrage Sites	Paikhed		Chasmandva			
a)	500 year return period diversion flood (Cumec)	2819		1961			
b)	100 year return period diversion flood (Cumec)	2247		1572			
c)	Standard project flood	4596		3213			
11.7.3	Design flood (Cumec)	Jheri	Paikhed	Chasmandva	Chikkar	Dabdar	Kelwan
a)	Dam (Cumec)	6539	5307	2578	5649	6683	7979
b)	Barrage	NA	2247	1572	2758	NA	NA
c)	Construction Diversion	NA	NA	NA	NA	NA	NA
d)	Flood control works	NA	NA	NA	NA	NA	NA
11.7.4	River flows (minimum observed)	(a)Water level (El-m)		(b)Discharge (Cumec)		(c)Months of Nil flow, if any	
	Par River	River bed level		0.00		January to May	
	Auranga River	River bed level		0.00		January to May	
	Ambica River	River bed level		0.00		January to May	
	Purna River	River bed level		0.00		January to May	

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	Mindhola River	River bed level	0.00	January to May			
	Tapi River	River bed level	0.00	January to May			
	Kim River	River bed level	0.00	January to May			
	Narmada River	River bed level	0.00	January to May			
12	Reservoir	Jheri	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan
12.1	Water levels (m)						
a)	Maximum Water Level (m)	247.00	249.00	215.00	212.00	170.00	166.00
b)	Full Reservoir Level (m)	246.00	248.00	214.00	210.00	169.00	164.00
c)	Minimum Draw Down Level (m)	204.00	190.00	190.00	179.00	139.00	136.00
d)	Outlet levels						
i)	Irrigation (m)						
ii)	Power TWL(m)	NA	172.00	173.02	172.00	136.96	135.46
iii)	Others (please specify) Invert level of penstock at inlet	NA	162.35	167.81	168.81	134.87	134.12
e)	Dead Storage Level (m)	199.00	172.00	176.00	170.00	127.00	128.2
f)	Deepest River bed level (m)	180.00	163.14	170.00	152.43	112.00	115.27
12.4	Live storage (MCM)	190.18	218.30	75.86	129.03	201.06	258.28
12.5	Capacity at (MCM)	Jheri	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan
a)	Full reservoir level (MCM)	206.03	229.53	83.63	141.99	222.38	282.17
b)	Minimum draw down level (MCM)	15.85	11.23	7.77	12.96	21.32	23.89
c)	Dead storage level (MCM)	9.23	0.92	0.36	3.69	4.32	6.51
12.6	Flood absorption capacity (MCM)	No Flood storage is earmarked for any of these project					
12.7	Sedimentation (MCM) and levels after	Jheri Reservoir		Paikhed Reservoir			
	Years	50 Years	100 Year	50 Year	100 Year		
a)	Above MDDL	9.69	20.79	10.02	20.10		
b)	Below MDDL	8.47	14.81	3.64	7.00		
c)	Sedimentation volume (MCM)	18.01	35.94	13.57	27.11		
d)	New zero elevation	185.00	198.50	164.34	171.88		
		Chasmandva Reservoir		Chikkar Reservoir			
		50 Years	100 Year	50 Years	100 Year		
a)	Above MDDL	2.282	4.723	8.018	17.081		
b)	Below MDDL	1.572	3.099	5.025	8.746		
c)	Sedimentation volume (MCM)	3.88	7.76	13.04	26.03		

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d)	New zero elevation	171.75	176.00	162.10	169.30			
	Sedimentation (MCM) and levels after	Dabdar Reservoir		Kelwan Reservoir				
	Years	50 Years	100 Year	50 Years	100 Year			
a)	Above MDDL	11.455	24.450	19.38	40.92			
b)	Below MDDL	7.994	14.950	10.29	18.33			
c)	Sedimentation volume (MCM)	19.55	39.03	29.90	59.69			
d)	New zero elevation	119.90	126.90	122.20	128.20`			
12.8	Average monthly evaporation losses from the reservoir	Monthly Evaporation depths (mm/day)						
		Jheri, Paikhed, Chasmandva, Chasmandva barrage, Dabdar and Kelwan			Paikhed barrage, Chikkar dam and Ukai dam			
i)	June	4.7			6.8			
ii)	July	2.3			3.3			
iii)	August	2.3			3.3			
iv)	September	3.6			5.1			
v)	October	4.6			6.5			
vi)	November	3.6			5.1			
vii)	December	2.9			4.1			
viii)	January	2.9			4.1			
ix)	February	3.0			4.6			
x)	March	4.6			6.5			
xi)	April	5.3			7.5			
xii)	May	5.7			8.1			
12.9	Seepage in the reservoir	All the reservoirs are water tight						
13	Submergence							
13.1	Land and property submerged							
	Name of project	Jheri	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan	Total
a)	Villages affected (No.)	6	11	7	9	11	17	61
i)	Fully	-	-	-	-	-	1	1
ii)	Partially	6	11	7	9	11	16	60
b)	Land affected (ha)							
i)	Gross	836	994	615	742	1249	1629	6065
ii)	Culturable	256	589	255	332	482	450	2364
iii)	Forest	408	317	300	300	614	890	2829
iv)	Others (specify) River portion	172	88	60	110	153	289	872
c)	Buildings / houses No.	98	331	379	345	563	793	2509

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d)	Road / Rail (km)	Major road connecting Peint-Surgana (1km)	Major road connecting Sidumber-Tutarkhed	nil	Waghai-Saputara National Highway (NH-360) (8 km).	Waghai-Ahwa Major Road (8 km)	Vyra-Ahwa Major Road (7 km)
e)	Transmission lines (km)	nil	nil	nil	The power and telephone lines of about 10 km length connecting Baj-Lahen-Dabdar village	The power and telephone lines of about 12 km length connecting Waghai-Pimpri village	The power and telephone lines of about 4 km length connecting Karlipadakhatal village
f)	Any other						
13.2	Submergence ratio (with reference to CCA)	Total submergence area (cultivated) under the 6 reservoirs is 2364 ha and the total CCA of the Link project is 232175 ha. Therefore, the submergence Ratio works out to 0.0102					
13.3	Number of families affected	Jheri	Paikhed	Chasmandva	Chikkar	Dabdar	Kelwan
		98	331	379	345	563	793
13.4	Anticipated back water levels at important places along the periphery of reservoir						
	(i)Jheri	247 m up to 14.60 km from dam axis					
	(ii)Paikhed	249 m up to 17.40 km from dam axis					
	(iii)Chasmandva	215 m up to 6.00 km from dam axis					
	(iv)Chikkar	212 m up to 11.00 km from dam axis					
	(v)Dabdar	170 m up to 11.00 km from dam axis					
	(vi)Kelwan	166 m up to 24.00 km from dam axis					
14	Head works						

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14.1 Dam							
14.1.1 Embankment Dam		Jheri	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan
a)	Type of dam (Homogenous/Zoned/Rock-fill/Concrete faced)	CFRD/Concrete	CFRD/Concrete	CFRD/Concrete	CFRD/Concrete	CFRD/Concrete	CFRD/Concrete
b)	TBL (m)	253.00	255.00	222.00	217.00	177.00	174.0
c)	Length of dam at top (m)	808.32	1431.85	2781	1887	1170	1330
i)	Right Flank	--	757.60	841	--	--	1141
ii)	Left Flank (m)	663.32	553.25	1862	1736	1035	--
d)	Top width (m)	10.00	10.00	10.00	10.00	10.00	10.00
e)	Maximum height above GL (m)	75.88	94.4	53.70	62.27	63.65	57.95
f)	Dyke(s)	The entire rim of proposed reservoirs is covered with the contours of value higher than the MWL as such no dyke(s) are proposed along the rim of reservoirs.					
i)	Number						
ii)	Total length (m)						
iii)	Maximum height m)						
g)	Type of cut off and maximum depth						
14.1.2 Masonry and Concrete Dam (Non-over flow section)		Jheri	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan
a)	Type of Dam (masonry/concrete/composite, any other)	Concrete	Concrete	Concrete	Concrete	Concrete	Concrete
b)	EL of top (m) (Road EL)	253	255	222	217	177	174
c)	EL of deepest foundation left side(m)	210	175	184	170	132	123
	EL of deepest foundation right side(m)	225	210	184	179	145	123
d)	Length at top (m)	54	49	34	79	44	98
e)	Length at the river bed (m)	40	45	30	75	40	40
f)	Width at top (m)	7	10	10	7	7	8
g)	Width at deepest bed level (m)	65.4	72.89	69.12	87.18	157.80	34.81
h)	Maximum height above deepest foundation level (m)	43	80	38	47	45	51
14.1.3 Spillway (overflow section)		Jheri	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan
a)	Type of spillway (Ogee / chute / side channel / tunnel / siphon / any other type (specify)	Ogee	Ogee	Ogee	Ogee	Ogee	Ogee
b)	Full reservoir level	246.00	248.00	214.00	210.00	169.00	164.00

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	(m)						
c)	Maximum water level (m)	247.00	249.00	215.00	212.00	170.00	166.00
d)	Length (m)	91.00	72.00	44.00	72.00	91.00	91.00
e)	Crest level (m)	234.00	236.00	202.00	198.00	157.00	152.00
f)	Deepest foundation level (m)	215.00	210.00	184.00	170.00	132.00	123.00
g)	Maximum height up to crest level (m)	19	26	18	18	25	29
h)	Number of gates	5	4	3	4	5	5
i)	Type of gate	Radial	Radial	Radial	Radial	Radial	Radial
j)	Size of gate (m X m)	15x12	15x12	12x12	15x12	15x12	15x12
k)	Maximum routed out flow (cumec)	6586	5226	3044	5226	6582	6582
l)	Tail water level (m)						
i)	Maximum (m)	228.00	230.00	192.00	175.00	139.00	135.46
ii)	Minimum (m)	223.50	220.00	187.50	172.50	134.00	134.40
m)	Type of energy dissipation arrangement	Ski jump bucket type (Stilling basin with Chute block and end sill)	Ski jump bucket type (Stilling basin with Chute block and end sill)	Ski jump bucket type (Stilling basin with Chute block and end sill)	Ski jump bucket type (Stilling basin with Chute block and end sill)	Ski jump bucket type (Stilling basin with Chute block and end sill)	Ski jump bucket type (Stilling basin with Chute block and end sill)
n)	Type of hoisting arrangement and its capacity	Hydraulic hoisting	Hydraulic hoisting	Hydraulic hoisting	Hydraulic hoisting	Hydraulic hoisting	Hydraulic hoisting

14.1.4	River sluice(s), Irrigation / Power outlet(s)	Paikhed dam	Paikhed barrage	Chasm andva dam	Chasma ndva barrage	Chikk ar	Dabdar	Kelwan
I	River sluice(s),	Nil						
II	Irrigation /Power							
a)	Purpose	Power	Irrigation	Power	Irrigation	Power/Irrigation	Power/Irrigation	Power/Irrigation
b)	Number	1	1	1	1	1	1	1
c)	Size (m)	2.5	147.5	1.8	128.0	1.8	2.5	2.5
d)	Sill level (El-m)	185	136	185.50	123.0	174.50	134.37	133.37
e)	Number of gates	1	7	1	8	1	1	1
f)	Type of gate	Vertical lift	Radial	Vertical lift	Vertical lift	Vertical lift	Vertical lift	Vertical lift
g)	Size of gate (mXm)	1.8x2.5	15x7	1.42x1.8	12x8	1.42x1.8	2x2.5	1.8x2.5
h)	Type of hoisting	Hydra	Hydrau	Hydra	Hydraulic	Hydra	Hydrau	Hydrau

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	arrangement and its capacity	ulic, 200 t	lic, 200 t	ulic, 180 t	, 200 t	ulic, 200 t	lic, 200 t	lic, 200 t
14.2	Weir	No weir is proposed						
14.3	Barrage	Paikhed			Chasmandava			
(i)	Design Flood Discharge (cumecs)	2223			1571			
(ii)	Total Length (m)	68.320			63.350			
(iii)	Total Waterway (m)	138.500			122.000			
(iv)	Top level of pier/abut (m)	152.000			133.000			
(v)	Crest Level (m)	136.000			123.000			
(vi)	Cistern Level (m)	131.500			118.500			
(vii)	Pond Level (m)	143.500 / 150.00			131.000			
(viii)	HFL (1 in 100) (m)	140.529			127.446			
(ix)	HFL (1 in 500) (m)	141.936			128.240			
(x)	Width of Pier (m)	4.500			3.000			
(xi)	Clear Width of each span (m)	15.000			12.000			
14.4	Head Regulator(s)	1 No.			1 No.			
15	Canal System							
15.1	Main Canal	Par-Tapi Reach			Tapi-Narmada Reach			
15.1.1	Purpose of canal (Irrigation/Power/Navig ation/Diversion/ Water Supply/ Multipurpose)	Irrigation/Power			Irrigation/Power			
15.1.2	Type							
	(a) Flow /Lift	Flow			Flow			
	(b) Lined / Un lined	Lined			Lined			
	(c) Type of lining	C.C lining			C.C lining			
15.1.3	Main canal data	Par-Tapi reach			Tapi-Narmada reach			
(i)	Length (km) (Total length:406.118)	214.811 (including 37.075 km of feeder pipe line and 1.15 km of tunnels)			191.307			
(ii)	FSL at Head/Tail (m)	142.800/105.275			81.790/53.573			
(iii)	Maximum discharging capacity at head/tail (cumec)	38.170/63.69			46.640/17.260			
(iv)	Full supply Depth at head (m)	2.80			3.22			
(v)	Bed width at head (m)	8.50			8.80			
(vi)	Side slope at head (H:V)	1.5:1			1.5:1			
(vii)	Bed Slope(range)	1 in 7500 to 1 in 8500			1 in 10 000			
(viii)	Total number of canal structures on main canal	154			315			
(ix)	Total assumed losses across the structures (m)	14.76			9.086			
(x)	Gross Command Area (En-route) (ha)	11448			57345			
(xi)	Culturable Command Area (En-route) (ha)	10100			49820			
15.1.4	Branch Canal(s)							

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	(a) Number	22			22		
	(b) Total length (km)	86			238		
15.1.5	Total length of districtribution system up to minimum discharge capacity of 24 cusec	-			-		
15.2	Feeder Pipe Lines	Chasmandva	Chikkar-Dabdar	Dabdar	Kelwan		
(i)	Length (km) (Total length:37.075)	2.859	14.342	12.258	7.616		
(ii)	F.S.L at Head/Tail (m)	130.600/ 129.748	172.000/ 169.128	136.960/ 132.768	135.460/ 117.309		
(iii)	Maximum discharging capacity at head/tail (cumec)	8.50	6.40	17.00	17.00		
(iv)	Full supply Depth at head (m)	1.60	1.50	2.2	2.25		
(v)	Diameter of pipe line (m)	2.60	2.50	2.90	2.60		
(vi)	Bed Slope(range)	1 in 5500	1 in 7500	1 in 5000	1 in 5500		
(vii)	Joins main canal at RD(km)	62.072	-	108.250	129.600		
15.3	Efficiencies (%)						
	(i) Conveyance	75			75		
	(ii) Field application	65			65		
15.4	Tunnel						
15.4.1	Jheri-Paikhed Tunnel						
(i)	Length of tunnel (m)	12700					
(ii)	Dia of tunnel (m)	3.0, D-shaped					
(iii)	Invert Level (m)	EL. 199.50 at inlet					
(iv)	Invert level (m)	EL. 185.00 at out fall					
15.4.2	Adit						
(i)	Length of Adit (m)	408.60					
(ii)	Size (m)	6.0x6.0, D-Shaped					
(iii)	Invert level (m)	EL. 210.00					
15.4.3	Tunnels along the link canal	RD from (m)	RD to (m)	Length (m)	Diameter (m)		
	Tunnel No.1	14650	14750	100	5.5		
	Tunnel No.2	24000	24350	350	5.5		
	Tunnel No.3	32350	32550	200	5.5		
	Tunnel No.4	37750	37800	50	5.5		
	Tunnel No.5	51500	51950	450	5.5		
		Total			1150		
16	Power	Paikhed	Chas mandva	Chikkar	Dabdar	Kelwan	Kelwan Feeder canal
16.1	Type – Conventional / Pumped storage	Convent ional	Conventi onal	Conventio nal	Conve ntional	Conventi onal	Conventi onal
16.2	Installed capacity (MW)	9	2	2	3.2	2.5	2
16.3	Annual PLF %	57.75	32.37	47.67	59.86	57.35	71.25

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16.4	Annual energy (MU)						
a)	Firm (MU)	45.53	5.67	8.35	16.60	13.07	12.48
b)	Seasonal (secondary) (MU)	10.59	0.72	-	-	-	-
	Total (MU)	56.12	6.39	8.35	16.60	13.07	12.48
16.5	Off peak requirement for pumping	NA	NA	NA	NA	NA	NA
16.6	Head Race Channel / Tunnel	NA	NA	NA	8300 m	5925 m	NA
16.7	Balancing Reservoir	No Balancing Reservoir Proposed					
16.8	Fore bay	NA	NA	NA	1612 m ³	1781 m ³	1650 m ³
16.9	Intakes	Paikhed	Chas mandva	Chikkar	Dab dar	Kelwan	Kelwan Feeder canal
a)	Upper Intake						
i)	Type & size of intake	Dam Intake	Dam Intake	Dam Intake	Dam Intake	Dam Intake	Canal Intake
ii)	Submergence of the entry below water level	Yes	Yes	Yes	Yes	Yes	Yes
iii)	Intake gates- number, type & size	1 No, Fixed Wheel Gate, Size: 1800 mm X 2500 mm	1 No, Fixed Wheel Gate, Size: 1420 mm X 1800 mm	1 No, Fixed Wheel Gate, Size: 1420 mm X 1800 mm	1 Nos, Fixed Wheel Gate, Size: 2000 mm X 2500 mm	1 Nos, Fixed Wheel Gate, Size: 1800 mm X 2500 mm	1 No, Fixed Wheel Gate, Size: 2000 mm X 2500 mm
iv)	Details of anti-vortex arrangements	Centre line of Penstock is kept 3.75 m below MDDL	Centre line of Penstock is kept 3.40 m below MDDL	Centre line of Penstock is kept 3.60 m below MDDL	Centre line of Penstock is kept 3.38 m below MDDL	Centre line of Penstock is kept 1.38 m below MDDL	-
v)	Type of hoisting arrangement and its capacity	Hydraulic					
		50 t	25 t	30 t	30 t	25 t	12 t
b)	Lower Intake (for pumped storage scheme)	NA	NA	NA	NA	NA	NA
16.10	Surge tank / shaft	NA	NA	NA	NA	NA	NA
16.11	Penstocks / pressure shafts	Paikhed	Chas mandva	Chikkar	Dab dar	Kelwan	Kelwan Feeder canal
a)	i) Number	1	1	1	1	1	

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	ii) Diameter and Length	2.5 m Dia: 230 m; 2.0 m Dia: 9 m; 1.6 m Dia: 71 m	1.8 m Dia: 78 m ; 1.2 m Dia: 36 m	1.8 m Dia: 59 m; 1.2 m Dia: 34 m	2.5 m Dia: 53 m; 1.6 m Dia: 51 m	2.5 m Dia: 51 m; 1.6 m Dia: 54 m	2.5 m Dia: 35 m; 1.6 m Dia: 16 m
b)	Bifurcation / trifurcation	Trifurcation	Bifurcation	Bifurcation	Bifurcation	Bifurcation	Bifurcation
16.12	Power House	Paikhed	Chas mandva	Chikkar	Dab dar	Kelwan	Kelwan Feeder canal
a)	Type (surface or underground)	Surface	Surface	Surface	Surface	Surface	Surface
b)	Maximum gross head (m)	76.00	40.98	38.00	32.04	28.54	16.17
c)	Minimum gross head (m)	18.20	16.98	7.00	2.04	0.54	-
d)	Head loss in water conductor system (m)	0.20	0.20	0.20	0.2	0.2	0.20
e)	Design net head (m)	56.53	32.78	27.47	24.49	22.16	15.97
f)	Dimensions (m) (L X B X H)	45.32 x 16.43 x 19.00	32.7x 13.90x 17.62	32.7x 13.90x 17.62	49.05 x 20.85x 117.61	32.7x 13.88x1 8.62	19.00x 14.70x 16.50
g)	Unit capacity(MW)	3x3	2x1	2x1	2x1.6	2x1.25	2x1
h)	Installed capacity (MW)	9	2	2	3.20	2.50	2
i)	Energy Generation(MU)	45.53	5.67	8.35	16.60	13.07	12.48
j)	Type of turbine	Francis	Francis	Francis	Francis	Francis	Kaplan
k)	Type of generator	AC Synchronous	AC Synchronous	AC Synchronous	AC Synchronous	AC Synchronous	AC Synchronous
l)	Type of power house crane	EOT	EOT	EOT	EOT	EOT	EOT
m)	Number & size of draft tube gates/bulk head & capacity of hoists	3 number vertical lift slide type (4020 mmX2300 mm) Rope drum hoist, 15 t	2 number vertical lift slide type (3400 mmX2340 mm) Rope drum hoist, 15 t	2 number vertical lift slide type (3400 mmX2340 mm) Rope drum hoist, 15t	2 number vertical lift slide type (5100 mmX2340 mm) Rope drum hoist, 15 t	2 number vertical lift slide type (3400 mmX2340 mm) Rope drum hoist, 12 t	2 number vertical lift slide type (2652 mmX1500mm) Rope drum hoist, 10 t
16.13	Switch yard	Paikhed	Chas	Chikkar	Dab	Kelwan	Kelwan

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			mandva		dar		Feeder canal
a)	Type	Out Door	Out Door	Out Door	Out Door	Out Door	Out Door
b)	Voltage level	33 kV	33 kV	33 kV	33 kV	33 kV	33 kV
16.14	Transformer Cavern	NA	NA	NA	NA	NA	NA
16.15	Tail Race Channel	Paikhed	Chas mandva	Chikkar	Dab dar	Kelwan	Kelwan Feeder canal
a)	Shape & size	Open Channel of width 26 m	Open Channel of width 5.00 m	Open Channel of width 5.00 m	Open Channel of width 5.00 m	Open Channel of width 5.00 m	Open Channel of width 3.00m
b)	Length (m)	40	470	22	40	20	5
c)	Recovery slope	1V:4H	1V:4.5H	1V:4H	1V:4H	1V:4H	1V:4H
d)	Maximum tail water level (m)	--	--	--	--	--	--
e)	Minimum tail water level (El-m)	170.50	171.52	170.00	134.00	134.00	116.57
f)	Average tail water level (El-m)	172.00	173.02	171.50	136.96	135.46	117.77
16.16	Tail Race Tunnel	NA	NA	NA	NA	NA	NA
17	Cost of project (lakh) Unit-wise						
	Unit – I: Head Works	474773 lakh					
	Unit – II: Canal and Conveyance system	455710 lakh					
	Unit – III: Power installations	18091 lakh					
	Unit – IV: Command Area Development	72547 lakh					
	Total cost of the project	1021121 lakh					
18	Benefits / Revenue	Quantity			Value (Rs. in lakh)		
a)	Food production (Quintals)	7510379			111176.70		
b)	Power (MU)	102			6120.00		
c)	Flood protection (ha)	-			-		
d)	Navigation	-			-		
e)	Water supply (MCM)	76			8987.00		
f)	Any other (fisheries) Tons	303			303.00		
	Total Benefits				126586.70		
g)	Total Annual cost				122364.64		
19	Benefit Cost (BC) Ratio and IRR						
a)	BC Ratio	1.035					
b)	Internal Rate of Return (IRR)	10.172%					

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ANNEXURE-V

Surplus water available for Diversion

Unit: MCM

Sl. No.	Name of the Basin	Effective drainage area (sq.km)	Gross annual yield at 75% dep.	Planned Basin Utilisations projected by States	Surplus yield at 75% dep.
1	Par	1648	1725.9	647.44	1078.46
2	Auranga	748	857.7	507.39	350.31
3	Ambica	2685	1914.1	1493.66	420.44
4	Purna	2193	1101.1	958.95	142.15
	Total	7274	5598.8	3607.44	1991.36

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**ANNEXURE-VI
Proposed Cropping Pattern**

16	Proposed Cropping Pattern			
16.1	Cropping Pattern for En-route command			
	Season/ Name of the Crop	% age of Area	Area of crop for En-route command (59920 ha)	Area of crop for Command of projects proposed by Government of Gujarat (45561 ha)
	Kharif			
	Paddy	8%	4794	3645
	Jowar	8%	4794	3645
	Pulses	4%	2397	1823
	Ground nut	8%	4794	3645
	Oilseed	8%	4794	3645
	Vegetables	4%	2397	1823
	L.S. Cotton	4%	2397	1823
	S. S. Cotton	8%	4794	3645
	Rabi			
	Wheat	8%	4794	3645
	Jowar	4%	2397	1823
	Maize	4%	2397	1823
	Vegetable	4%	2397	1823
	Pulses	8%	4794	3645
	Oilseeds	4%	2397	1823
	Ground nut	4%	2397	1823
	Hot Weather			
	Bajra	2%	1197	910
	Vegetable	2%	1197	910
	Soyabean	2%	1197	910
	Perennial			
	Sugarcane	4%	2397	1822
	Fruits	2%	1198	910
	Total	100%	59920	45561
16.2	Cropping Pattern for feeder canal Command			
	Season/ Name of the Crop	% age of Area	Area of crop for feeder canal (1270 ha)	
	Kharif			
	Paddy	8%	102	
	Jowar	8%	102	
	Pulses	4%	51	
	Ground nut	8%	102	
	Oilseed	8%	102	
	Vegetable	4%	51	
	L.S. Cotton	4%	51	
	S. S. Cotton	8%	102	
	Rabi			
	Wheat	8%	102	
	Jowar	4%	51	
	Maize	4%	51	

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	Vegetable	4%	51
	Pulses	8%	102
	Oilseeds	4%	51
	Ground nut	4%	51
	Hot Weather		
	Bajra	2%	24
	Vegetable	2%	24
	Soyabean	2%	24
	Perennial		
	Sugarcane	4%	51
	Fruits	2%	25
	Total	100%	1270
16.3	Cropping Pattern adopted for the Command Areas of Tribal area of right side of canal, Vicinity of proposed reservoirs, tribal area on right side of NMC and command area of Narmada canal system of SSP to be taken over the Link Canal		
S. No.	Crop Season/ Name of the Crop	Command Areas of Tribal area of right side of canal, Vicinity of proposed reservoirs and tribal area on right side of NMC (83056 ha)	Target command area of Narmada canal system of SSP to be taken over the Link Canal (43268 ha)
		% age of CCA	Area of Crop (ha)
		% age of CCA	Area of Crop (ha)
	Kharif		
1	Late Paddy	--	--
2	Early Paddy	--	--
3	Maize/Bajra	--	--
4	Oilseeds	10	8306
	Rabi		
5	Wheat	55	45681
6	Jowar	--	--
7	Pulses/Vegetables	20	16611
8	Potato	6	4983
	Two Seasonal		
9	S. S. Cotton	--	--
10	L. S. Cotton	--	--
11	Tobacco	--	--
12	Lucene	--	--
	Hot Weather		
13	Bajra	--	--
14	Fodder	6	4983
	Perennial		
15	Sugarcane	--	--
16	Fruits	3	2492
	Total	100	83056
		100	43268

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ANNEXURE-VII

Details of sources of construction material

S. No.	Name of the Project	Location of Quarry/ borrow site	Distance of Quarry/Borrow site
	DAM		
1	Jheri	Sand- Confluence of Par & Keng river. Rock- Left bank of Keng river on U/S of dam axis.	500 m. 900 m.
2	Paikhed	Sand- on D/S of dam axis. Rock- on D/S of dam axis.	1 km. 1 km.
3	Chasmandva	Sand- At Mola amba bridge on D/S of dam axis. Rock- At choravani village on U/S of dam axis.	4 km. 1 km.
4	Chikkar	Sand- on D/S of dam axis near Rambhas village. Rock- on D/S of dam axis near Rambhas village.	2 km. 1.5 km.
5	Dabdar	Sand- D/S of Mheskatri-Waghai road bridge. Rock- Near Gira Village.	2.75 km. 2.5 km.
6	Kelwan	Sand- Near Wankan village. Rock- Near Wankan village.	500 m. 1.25 km.

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ANNEXURE-VIII

FOREST DETAILS

The study area falls in the South Indian Tropical Moist Deciduous forests (Group 3A/C1) (Champion and Seth's revised (1968)). The main two categories of the forest types existing in the study area are:

- Southern Indian Moist Deciduous Forests
- Southern Dry Deciduous Forests

In all eight subtypes forest categories are found viz.

- 3B/C1a Very moist teak forests
- 3B/C1b Moist teak forests
- 3B/C1c Slightly moist teak forest
- 3B/C2 Southern moist mixed deciduous forest
- 5A/C1b Dry teak forests
- 5A/C3 Dry mixed deciduous forests
- 5E9 Dry Bamboo brakes
- 5/1S1 Dry tropical riverine forest

1. 3B/C1a – Very moist teak forests

Very moist teak forest receives tropical rainfall over 2500 mm and characterized by deep alluvial and clayey soil. Very dense evergreen undergrowth and little natural regeneration are visible. Main species of the area are *Tectona grandis*, *Terminalia crenulata*, *Terminalia bellirica*, *Grewia tiliaefolia*, *Dalbergia latifolia*, *Lagerstroemia lanceolata*, *Adina cordifolia*, *Pterocarpus marsupium* and *Dendrocalamus strictus*.

2. 3B/C1b – Moist teak forests

Rainfall in the subtype is from 1600 to 2500 mm. deep loamy soils are found. Characteristic species are *Tectona grandis*, *Terminalia crenulata*, *Adina cordifolia*, *Lannea coromandelica*, *Anogeissus latifolia*, *Diospyros melanoxylon*, *Schleichera oleosa*, *Ougenia oogeinensis*, *Embllica officinalis*, *Careya arborea* and *Dendrocalamus strictus*.

3. 3B/C1c- Slightly moist teak forest

Rainfall in this subcategory ranges from 1200 to 1600 mm. The soils are moderately deep loamy. The portion of dry deciduous associate is higher than in moist teak forests. Teak usually forms the major portion of the over wood. Characteristic species are *Terminalia crenulata*, *Adina cordifolia*, *Dalbergia latifolia*, *Schleichera oleosa*, *Mitragyna parvifolia*, *Syzygium cumini* and *Dendrocalamus strictus*.

4. 3B/C2 – Southern Moist mixed Deciduous forest

This subtype is mostly found on hilly ground with shallow porous soils. Rainfall is more or less moist type. Typical species of the area are *Pterocarpus marsupium*, *Bombax ceiba*, *Terminalia bellirica*, *Anogeissus latifolia*, *Dalbergia latifolia*, *Terminalia crenulata*, *Lannea coromandelica*, *Madhuca indica*, *Garuga pinnata*, *Tectona grandis*, *Embllica officinalis*, *Lagerstroemia parviflora* and *Dendrocalamus strictus*. Grasses also makes important vegetation part.

5. 5A/C1b – Dry teak forests

The soil is shallow porous or stiff clayey. Characteristic species area *Anogeissus latifolia*, *Diospyros melanoxylon*, *Pterocarpus marsupium*, *Cassia fistula*, *Butea*

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monosperma, *Adina cordifolia*, *Mitragyna parvifolia*, *Bridelia retusa*, *Aegle marmelos*, *Bauhinia racemosa*, *Lagerstroemia parviflora*, *Dendrocalamus strictus* (Non luxuriant growth). *Helicteres isora*, *Azanza lampas*, *Halarrhena antidysenterica*, *Carvia callosa* and *Woodfordia fruticosa*.

6. 5A/C3 – Dry mixed deciduous forests

Some typical species, notably *Boswellia serrate* are more conspicuous in this subtype. Thorny plants are also present and increases in response to heavy grazing and fires. Bamboo is absent and usually of poor quality when present. Grass is conspicuous unless it is burnt down or grazed.

Main species include *Terminalia crenulata*, *Soymida febrifuga*, *Anogeissus latifolia*, *Aegle marmelos*, *Embllica officinalis*, *Acacia catechu*, *Pterocarpus marsupium*, *Zizyphus xylopyrus*, *Lannea coromandelica* and *Dendrocalamus strictus*. *Heteropogon contortus* and *Themeda quadrivalvis* are common grasses found in this subtype.

7. 5E9 – Dry Bamboo brakes

This subtype occurs mainly on dry hillside. Bamboo forest is very less in the study area. Only one species of Bamboo i.e. *Dendrocalamus strictus* occurs in the study area.

8. 5/1S1 – Dry tropical riverine forest

The subtype is found along the larger streams in dry deciduous forests. It gets widens as the valley widens and extends into moist deciduous forests. This occurs on the narrow strips along rivers. Main species of the area include *Mitragyna parviflora*, *Derris indica*, *Bauhinia racemosa*, *Butea monosperma*, *Tamarindus indica*, *Mallotus philippensis*, *Vitex negundo*, *Terminalia arjuna* and *Holopterlea integrifolia*.

List of plants recorded from the recorded from the Study Area

S. No	Family and Botanical Name	Vernacular Name	Life Form	Status
1	Acanthaceae			
1	<i>Neuracanthus sphaerostachyus</i> (Nees) Dalz.	Ghans	Herb	Common
2	<i>Peristrophe bicalyculata</i> (Retz.) Nees	Kari Adhedi	Herb	Common
2	Amaranthaceae			
3	<i>Achyranthes aspera</i> L. var. <i>argentea</i> Hook. f.	Angario	Herb	Common
4	<i>Amaranthus hybridus</i> L. subsp. <i>cruentus</i> (L.) Thell.	Rajgaro	Herb	Common
5	<i>Alternanthera sessilis</i> (L.) DC.	Jar Bhaji, Jar Bhangaro	Herb	Common
3	Anacardiaceae			
6	<i>Mangifera indica</i> L.	Ambo	Tree	Common
7	<i>Lannea coromandelica</i> (Houtt.) Hrrill	Modad, Modar	Tree	Not Common
4	Annonaceae			
8	<i>Annona squamosa</i> L.	Sitaphal	Small Tree	Common
9	<i>Milium tomentosum</i> (Roxb.) Sinclair	Umbh	Tree	Not Common

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S. No	Family and Botanical Name	Vernacular Name	Life Form	Status
5	Apocynaceae			
10	<i>Holarrhena antidysenterica</i> (Heyne ex Roth) Wall.	Indrajav	Tree	Not Common
11	<i>Carissa congesta</i> Wt.	Karamda	Shrub	Common
12	<i>Wrightia tinctoria</i> R. Br.	Kudi	Tree	Common
13	<i>Wrightia tomentosa</i> R. & S.	Kudo	Tree	Not Common
6	Arecaceae			
14	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajuri	Tree	Common
7	Asteraceae			
15	<i>Sphaeranthus indicus</i> L.	Bhuradu	Herb	Common
16	<i>Xanthium strumarium</i> L.	Kantadiyu	Herb	Common
17	<i>Gnaphalium polycaulon</i> Pers.	-	Herb	Not Common
18	<i>Eclipta prostrata</i> (L.) L. Mant.	JalBhangro	Herb	Abundant
19	<i>Tridax procumbens</i> L.	PiloBhangaro	Herb	Abundant
20	<i>Vernonia cinerea</i> (L.) Less.	Sahdevi	Herb	Abundant
8	Bignoniaceae			
21	<i>Oroxylum indicum</i> (L.) Vent.	Tetu	Tree	Not Common
9	Bombacaceae			
22	<i>Bombax ceiba</i> L.	Simalo, Savar	Tree	Not Common
10	Burseraceae			
23	<i>Boswellia serrata</i> Roxb.	Salai	Tree	Not Common
24	<i>Garuga pinnata</i> Roxb. Hort. Beng.	Kakod	Tree	Not Common
11	Caesalpiaceae			
25	<i>Cassia auriculata</i> L.	Aval	Shrub	Abundant
26	<i>Cassia tora</i> L.	Kuvadiya, Kuvar	Herb	Abundant
27	<i>Cassia occidentalis</i> L.	Puvad, Puwar	Herb	Common
28	<i>Cassia fistula</i> L.	Garmaro	Tree	Common
29	<i>Tamarindus indica</i> L.	Amali	Tree	Common
12	Capparaceae			
30	<i>Capparis sepiaria</i> L.	Karamadi	Stragglng Shrub	Not Common
31	<i>Crateva nurvala</i> Buch-Ham. var. nurvala	Vayvarano	Tree	Not Common
13	Caricaceae			
32	<i>Carica papaya</i> L.	Papaiya	Tree	Common
14	Combretaceae			
33	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bahedo, Beda	Tree	Not Common
34	<i>Anogeissus latifolia</i> (Roxb.) Wall. ex Bedd.	Dudhikado	Tree	Not Common
35	<i>Terminalia crenulata</i> Roth.	saadad	Tree	Not Common

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S. No	Family and Botanical Name	Vernacular Name	Life Form	Status
36	<i>Anogeissus pendula</i> Edgew.	safed dhav	Tree	Not Common
37	<i>Terminalia arjuna</i> (Roxb.) W. & A.	Arjun Sadad	Tree	Common
15	Cyperaceae			
38	<i>Cyperus rotundus</i> L. subsp. rotundus	Chiyo, Moth	Sedge	Abundant
16	Ebenaceae			
39	<i>Diospyros melanoxylon</i> Roxb.	Timru	Tree	Common
17	Euphorbiaceae			
40	<i>Jatropha curcas</i> L.	Ratanjyot	Shrub	Common
41	<i>Euphorbia hirta</i> L.	Dudheli	Herb	Abundant
42	<i>Phyllanthus fraternus</i> Webst.	BhoyAmali	Herb	Common
18	Fabaceae			
43	<i>Abrus precatorius</i> L.	Chanothi	Climber	Common
44	<i>Caesalpinia crista</i> L.	Karchado	Straggling Shrub	Common
45	<i>Derris indica</i> (Lam.) Bennet	Karanj	Tree	Common
46	<i>Butea monosperma</i> (Lam.) Taub.	khakhro	Tree	Common
47	<i>Dalbergia sissoo</i> Roxb.	Sisam	Tree	Common
48	<i>Indigofera linnaei</i> Ali.	PatGari	Herb	Abundant
49	<i>Tephrosia purpurea</i> (L.) Pers.	Sarpankho	Herb	Abundant
19	Flacourtiaceae			
50	<i>Casearia graveolens</i> Dalz.	Karamado	Tree	Not Common
51	<i>Flacourtia indica</i> (Burm. F.) Merr.	KhotoPapad	Small Tree	Not Common
20	Lamiaceae			
52	<i>Anisomeles</i> sp.	-	Under Shrub	Common
21	Lecythydaceae			
53	<i>Careya arborea</i> Roxb.	Kubhiyo	Tree	Not Common
22	Liliaceae			
54	<i>Asparagus racemosus</i> Willd. var. javanicus (Kunth) Baker	Satavari	Sarmentose Shrub	Not Common
23	Lythraceae			
55	<i>Lawsonia inermis</i> L.	Mahendi	Shrub	Common
24	Malvaceae			
56	<i>Sida acuta</i> Burm. f.	Balu	Herb	Common
57	<i>Hibiscus vitifolius</i> L.	Jungali Kapas	Under Shrub	Common
58	<i>Abelmoschus moschatus</i> Medicus.	Lalbhindi	Under Shrub	Common
59	<i>Abelmoschus minihot</i> (L.) Medic.	Ranbheda	Under Shrub	Not Common
25	Meliaceae			

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S. No	Family and Botanical Name	Vernacular Name	Life Form	Status
60	<i>Soymida febrifuga</i> (Roxb.) A.	Ranbhen	Tree	Not Common
26	Menispermaceae			
61	<i>Tinospora cordifolia</i> (Willd.) Miers	Gol, Golvel	Climber	Common
62	<i>Cissampelos pareira</i> L.	Padtarvel	Twiner	Not Common
63	<i>Cocculus hirsutus</i> (L.) Diels	Vevdi	Straggling Shrub	Common
27	Mimosaceae			
64	<i>Acacia nilotica</i> (L.) Del. subsp. <i>indica</i> (Bth.) Brenan	Baaval	Tree	Common
65	<i>Acacia chundra</i> (Roxb. Ex Rottl.) Willd.	Khair, Kher	Tree	Not Common
66	<i>Albizia lebbbeck</i> (L.) Bth.	Silayo, Sirish	Tree	Common
28	Molluginaceae			
67	<i>Glinus lotoides</i> L.	Okharad	Herb	Abundant
29	Moraceae			
68	<i>Ficus amplissima</i> Sm.	Payar	Tree	Not Common
69	<i>Artocarpus heterophyllus</i> Lam.	Phanas, Fanas	Tree	Not Common
70	<i>Ficus religiosa</i> L.	Pipado	Tree	Common
71	<i>Ficus racemosa</i> L.	Umar, Umoro	Tree	Not Common
72	<i>Ficus benghalensis</i> L.	Vad	Tree	Common
73	<i>Ficus</i> sp.	Pipar	Tree	Not Common
30	Myrtaceae			
74	<i>Syzygium cumini</i> (L.) Skells	Jambu	Tree	Common
31	Papaverceae			
75	<i>Argemone mexicana</i> L.	Darudi	Herb	Abundant
32	Periplocaceae			
76	<i>Hemidesmus indicus</i> (L.) Schult.	Uplasari	Twiner	Common
33	Poaceae			
77	<i>Cenchrus ciliaris</i> L.	Dhaman	Grass	Common
78	<i>Dendrocalamus strictus</i> Nees	Vaans, Vansh	Tree	Common
79	<i>Apluda mutica</i> L.	Gas	Grass	Common
80	<i>Dichanthium annulatum</i> (Forak.) Stapf	Jinjavo	Grass	Not Common
81	<i>Apluda mutica</i> L.	Gas	Grass	Abundant
34	Polygonaceae			
82	<i>Polygonum plebeium</i> R. Br. var. <i>indica</i> (Heyne ex Roth) Hook.	-	Herb	Abundant
35	Rhamnaceae			
83	<i>Zizyphus mauritiana</i> Lam.	Bor, Boradi	Small Tree	Common

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S. No	Family and Botanical Name	Vernacular Name	Life Form	Status
84	<i>Zizyphus nummularia</i> (Burm. F.) W. & A.	Chana Boradi	Under Shrub	Common
36	Rubiaceae			
85	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Karam	Tree	Not Common
86	<i>Morinda tomentosa</i> Heyne ex Roth.	Al	Tree	Not Common
87	<i>Adina cordifolia</i> (Roxb.) Bth. & Hk. f. ex Brandis	Haldu	Tree	Not Common
37	Rutaceae			
88	<i>Aegle marmelos</i> (L.) Corr.	Bili, Bilvo	Tree	Common
38	Sapotaceae			
89	<i>Madhuca indica</i> J. F. Gmel.	Mahudo	Tree	Common
39	Solanaceae			
90	<i>Solanum surattense</i> Burm. f.	Jangli Ringani	Herb	Abundant
40	Sterculiaceae			
91	<i>Helicteres isora</i> L.	Musadaiyo	Shrub	Not Common
92	<i>Sterculia urens</i> Roxb.	Kadayo	Tree	Not Common
41	Tiliaceae			
93	<i>Corchorus aestuans</i> L.	Kagsingh	Herb	Common
94	<i>Grewia tiliaefolia</i> Vahl var. <i>tiliaefolia</i>	Phalsa, Dhaman	Shrub	Not Common
95	<i>Triumfetta rotundifolia</i> Lam.	Zipto	Herb	Common
42	Typhaceae			
96	<i>Typha angustata</i> Bory. & Chaub.	Bajgaro	Herb	Abundant
43	Ulmaceae			
97	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Kanji	Tree	Not Common
44	Verbenaceae			
98	<i>Tectona grandis</i> L.f.	Saag, Sag	Tree	Abundant
99	<i>Gmelina arborea</i> Roxb.	Seven, Sewan	Tree	Common
45	Vitaceae			
100	<i>Vitis vinifera</i> L.	Deshi Draksh	Climber	Not Common
46	Zygophyllaceae			
101	<i>Tribulus terrestris</i> L.	Gokhru	Herb	Common

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ANNEXURE-IX

PROPOSED TERMS OF REFERENCE FOR CONDUCTING CEIA STUDY FOR PAR-TAPI-NARMADA LINK PROJECT

1. GENERAL

The Environmental Impact Assessment of the proposed Par Tapi Narmada Link project shall examine the project's potential negative and positive environmental impacts and shall recommend measures required to prevent, minimize, mitigate or compensate for adverse impacts and improve environmental performance of the scheme.

The Ministry of Environment Forest and Climate Change (MoEF&CC), Government of India (GoI) has issued a notification called EIA Notification 2006 on September, 14, 2006. The project requires Environmental Clearance from Ministry of Environment Forest and Climate Change (MoEF&CC). An EIA study is a pre-requisite for obtaining Environmental Clearance. The Study Area for the EIA study shall comprise of the following:

- Submergence area

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- Area within 10 km of various project appurtenances including i.e. canal network, submergence area, etc.
- Gross Command Area
- Catchment area intercepted at the dam site

EIA Study will be carried out with an objective to:

- Establish and Assess Baseline Environmental-Social ground truth within 10 Km. radius and catchment of the project area.
- Identify and Evaluate Environmental-Social Impacts of Proposed project.
- Prepare Environmental Monitoring & Management Plan
- Identification of the project affected people and prepare rehabilitation and resettlement plan, and

The EIA Study will be carried out in accordance with the norms of EIA Notification 2006 on September, 14, 2006 and its subsequent amendments.

2. DATA COLLECTION/GENERATION

The details of baseline data/ information that would be collected are as follows:

1. **Geological and Geophysical Aspects**

- Geography & physiography of the project area
- Design discharge & its RI (Recurrence interval)
- Regional Geology and structure of the catchment
- Seismicity, tectonics and history of past earthquakes in the area
- Critical review of the geological features around the project area
- Impact of project on geological environment
- Justification for location & execution of the project in relation to structural components.

Seismo-tectonics

Study of Design Earthquake Parameters

A site specific study of earth quake parameters shall be conducted. The results of the site specific earth quake design parameters will be sent for approval of the NCSDP (National Committee of Seismic Design Parameters, Central Water Commission, New Delhi.

2. **Hydrology of the basin**

- Hydro-meteorology, drainage systems
- Water availability for the project and the aquatic fauna
- Design discharge and its recurrence interval

3. **Biological Resources**

Flora

- Forests and forest types
- Water body inundating forest area
- Vegetation profile, no. of species in the project area, etc.
- Community Structure through Vegetation mapping
- Species Diversity Index (Shanon-Weiner) of the biodiversity in the project area as well as plant fossil & phytoplankton
- Documentation of economically important plants, medicinal as well as timber, fuel wood etc.

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- Endemic, endangered and threatened species
- Impact of impoundment and construction activities on the vegetation
- Location of any Biosphere Reserve, National Park or Sanctuary in the vicinity of the project , if any
- Cropping and Horticulture pattern and practices in the study area.

Fauna

- Inventorisation of terrestrial wildlife including reptiles, herpetofauna, butterflies and amphibians, along with their present status in the project area
- Zoogeographic distribution/affinities, Endemic, threatened and endangered species.
- Avifauna - Status, Resident/Migratory/Passage migrants, Impact of project on threatened/endangered taxa, if any.
- RET faunal species are to be classified as per IUCN Red Data list or as per different schedule of Indian Wildlife Protection Act, 1972.
- Effect on fish migration and habitat degradation due to project.
- Existence of National Park, Sanctuary, Biosphere, Reserve Forest etc. in the study area if any, would be detailed

Aquatic Ecology

- Aqua-fauna like macro-invertebrates, zooplankton, phytoplanktons, benthos, water dependent avifauna etc and Assessment of biotic resources – primary productivity.
- Conservation Status

Fish and Fisheries

- Migratory fish species, if any and their breeding grounds
- Impact of barrage building on fish migration and habitat degradation
- Overall ecological impact up to 10 km d/s from the dam site and the impact of untreated and waste water in to the river shall be assessed.

Conservation areas and status of threatened/endangered taxa

- Biotic Pressures
- Management plan for conservation areas and threatened/endangered taxa

Remote Sensing & GIS studies and various maps

- Delineation of critically degraded areas in the catchment area intercepted at the dam site up to the upstream project on the basis of Silt Yield Index as per the methodology of AISLUS
- Land use and land cover mapping
- Drainage pattern/map
- Detailed map showing soil classification of the command area & map showing land irrigability classification of the command area
- Sampling location map for all the parameters at least in 1:50,000 scale; along with FCC a pie diagram to show proportions of different land use/land cover patterns in the project area

Socio-economic aspects

- Land details
- Demographic profile

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- Economic structure
- Development profile
- Agricultural practices
- Infrastructure facilities: education, health and hygiene, communication network, etc.
- Impact on socio-cultural aspects due to the proposed project.

Other Details

- Irrigation planning for the project.
- Various sampling locations shall be shown on a map.
- Plan for covering 10% of the area under pressurized irrigation including its cost.

5. Collection of data pertaining to water (physico-chemical and biological parameters), air and noise environment and likely impact during construction and post construction periods.

Air Environment

- Baseline Information on ambient air quality in the project area covering aspects like Particulate Matter less than 10 microns (PM10), SO₂, NO₂
- Noise Environment

Construction Methodology and Schedule

6. PRIMARY DATA COLLECTION

The details of primary data to be collected are given in Table-1.

Table - 1: Details of primary data generation

Description	No. of locations	Frequency of Sampling
AIR Ambient air quality monitoring (24 hourly samples), twice a week for 2 weeks Parameters : RPM, SO ₂ , NO ₂	10	One season (monsoon)
RIVERS PAR, AURANGA, AMBICA AND PURNA Samples to be collected from various representative locations in and around project site Parameters : Temperature, pH, Electrical Conductivity, Total Dissolved Solids, Alkalinity, Total Hardness, Chlorides, Sulphates, Fluorides, Phosphates, Calcium, Magnesium, Sodium, Potassium, Iron, Chromium, Lead,	18	One season (monsoon)

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Description	No. of locations	Frequency of Sampling
Cadmium, Mercury, Zinc, DO, BOD, COD, Total Coliform		
GROUND WATER Samples to be collected from various representative locations in the command area Parameters : Temperature, pH, Electrical Conductivity, Total Dissolved Solids, Total Hardness, Chlorides, Sulphates, Fluorides, Phosphates, Calcium, Magnesium, Sodium, Potassium, Iron, DO, BOD, COD	47(@ one sample per 5000 ha)	One season (monsoon)
SOILS Sampling in the command area Parameters : pH, N,P,K, organic matter, soil texture, Electrical Conductivity, pH of the saturation extract, Calcium, Magnesium, Sodium, Potassium	47 @ one sample per 5000 ha)	One season (monsoon)
NOISE Hourly readings taken for 24 hours (Leq.)	5	One season (monsoon)
TERRESTRIAL ECOLOGY Parameters: Density, Diversity and abundance of various floral species. Estimation of diversity indices Presence of various faunal species as observed during the ecological survey shall also be recorded and studied	15	One season (monsoon)
AQUATIC ECOLOGY Parameters: Density, diversity and abundance of various phytoplanktons and zooplanktons, periphytons, macro-invertebrates species, primary productivity, fish species	18	One season (monsoon)

7.2 Impacts during the operation phase

Land Environment

- Impact on land use pattern due to increase in cropping intensity.
- Increased irrigation intensity in the command area.
- Impacts on soil quality due to increased and continued use of agro-chemicals.
- Increased potential for water logging and soil salinization in the command area.
- Impacts due to acquisition of land for various project appurtenances including ownership status.

Water Environment

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- Impacts on reservoir water quality.
- Disposal of effluents containing agro-chemicals including pesticides from surface and sub-surface drainage system.
- Increased use of agro-chemicals in the command can lead to water pollution.

Ecology

- Impacts on the bio-diversity as a result of introduction of irrigation in the command area.
- Impacts due to acquisition of forest land and impacts on flora and fauna.
- Impacts on ecologically sensitive sites like national park, wildlife sanctuary, etc. of any.
- Impacts on rare, endangered and threatened species.
- Impacts on medicinally important and other economically important species if any.
- Impacts on migratory routes of wildlife.
- Increased potential for farm and tank fisheries in the command area.

Socio-Economic Environment:

- Acquisition of private lands for construction of various project appurtenances namely construction of road network joining the quarry sites and the construction sites, canal and drainage network in the command area.
- Social Impact Assessment of PAFs
- Improvement in employment potential as a result of increase in irrigation intensity.
- Improvement in quality of life as result of higher agricultural production, and improvement in income levels.
- Impacts on livestock.
- Increased incidence of vector- borne diseases.
- Impacts on incidence of water-borne diseases
- Improvement in public health, educational status, etc. as a result of economic development.
- Improvement in the status of livestock as a result of greater water availability and fodder from agricultural residues.
- Impetus to urbanization and industrialization as a result of improved water availability.

8. ENVIRONMENTAL MANAGEMENT PLAN

Feasible and cost effective measures to prevent or reduce significant negative impacts to the acceptable levels are to be developed, including the estimate of the impacts and cost of these measures, and of the institutional and training requirements to implement them. When impacts cannot be mitigated, compensation to affected parties shall be considered. The management measures proposed to be suggested for the following aspects:

- Measures to control the water pollution due to various effluents to be discharged during construction phase.
- Measures to control air pollution during construction phase.
- Measures to contain noise pollution and mitigate adverse impact on construction staff and habitat in the study area.
- Reclamation of areas disturbed during construction including quarry stabilization and construction waste disposal sites
- Development of public health management plan
- Maintenance of water quality during project operation phase.
- Compensatory Afforestation Plan in lieu of forest land to be acquired for the

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- project
- Biodiversity conservation plan
 - Greenbelt development along periphery of reservoir, colonies, approach road, canals etc.
 - Health Delivery system.
 - Air Pollution Control.
 - Noise Control measures.
 - Sustenance and enhancement of fisheries potential.
 - Infrastructure development for agriculture.
 - Measures to control water logging in Command area including conjunctive use of ground
 - Management of water-borne and vector-borne diseases
 - Control of Aquatic Weeds
 - Command Area Development Plan for the project and time target for its implementation
 - Review of topographical conditions to ascertain the requirement of land leveling and other OFD works
 - Sample plan of one outlet covering water courses, field drains, irrigation channels, etc.
 - Detailed plan for covering 10% of the area command area under pressurized/drip irrigation, including its cost.

9. RESETTLEMENT AND REHABILITATION PLAN

About 2364 ha of private land is to be acquired. A total of 61 villages are likely to be affected, of which 1 will be fully affected. About 2398 project affected families in various villages are likely to lose only land. About 111 project affected families are likely to lose both land and homestead due to reservoir submergence. A total number of 2509 PAFs will be losing land in varying proportions in all the six reservoirs proposed under Par- Tapi- Narmada link project. The reservoir wise details in this regard are given in the Tables 2 to 8.

Table-2: Details of PAFs losing land in Chasmandva Reservoir

S. No.	State	District	Taluka	Village	No of PAFs losing Land due to submergence	Total area under submergence (Ha)
1	Gujarat	Navsari	Bansda	Chorvani	127	111
2	Gujarat	Navsari	Bansda	Nirpan	56	66
3	Gujarat	Valsad	Dharampur	Chasmandva	79	63
4	Gujarat	Valsad	Dharampur	Jagiri	68	61
5	Gujarat	Valsad	Dharampur	Nadagdhari Jungle	41	31
6	Maharashtra	Nasik	Surgana	Mandha	6	12
7	Maharashtra	Nasik	Surgana	Ragatvihir	1	1
Total					378	345

Table-3: Details of PAFs losing land in Chikkar Reservoir

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S. No.	State	District	Taluka	Village	No of PAFs losing Land due to submergence	Total area under submergence (Ha)
1	Gujarat	Dangs	Ahwa	Baja	20	7
2	Gujarat	Dangs	Ahwa	Barkhandhia	36	58
3	Gujarat	Dangs	Ahwa	Chikkar (Rambhas Saja)	78	95
4	Gujarat	Dangs	Ahwa	Chikhalda	10	11
5	Gujarat	Dangs	Ahwa	Khirmanani	18	26
6	Gujarat	Dangs	Ahwa	Kunda	32	20
7	Gujarat	Dangs	Ahwa	Lahandabdar	1	3
8	Gujarat	Dangs	Ahwa	Sadadmali	3	6
9	Gujarat	Dangs	Ahwa	Sakarpatani	33	74
10	Gujarat	Dangs	Ahwa	Susardi	95	104
Total					326	403

Table-4: Details of PAFs losing land in Dadbar Reservoir

S. No.	State	District	Taluka	Village	No of PAFs losing Land due to submergence	Total area under submergence (Ha)
1	Gujarat	Dangs	Ahwa	Bhawadi	109	85
2	Gujarat	Dangs	Ahwa	Chichigaontha	92	54
3	Gujarat	Dangs	Ahwa	Dabdar Waghari	68	42
4	Gujarat	Dangs	Ahwa	Dhadhra	40	62
5	Gujarat	Dangs	Ahwa	Gira	42	29
6	Gujarat	Dangs	Ahwa	Kudkas	112	114
7	Gujarat	Dangs	Ahwa	Kukadhakhi	90	62
8	Gujarat	Dangs	Ahwa	Pimpri	4	4
Total					557	452

Table-5: Details of PAFs losing land in Jheri Reservoir

S. No.	State	District	Taluka	Village	No of PAFs losing Land due to submergence	Total area under submergence (Ha)
1	Maharashtra	Nashik	Peint	Ambasa	15	25
2	Maharashtra	Nashik	Peint	Ambe	1	-
3	Maharashtra	Nashik	Peint	Bordha	1	-
4	Maharashtra	Nashik	Peint	Gandole	13	15
5	Maharashtra	Nashik	Peint	Jheri	1	-
6	Maharashtra	Nashik	Peint	Kahandolpad	48	1

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7	Maharashtra	Nashik	Peint	Khirdi	11	18
8	Maharashtra	Nashik	Peint	Khokarvihir	1	-
Total					91	59

Table-6: Details of PAFs losing land in Kelwan Reservoir

S. No.	State	District	Taluka	Village	No of PAFs losing Land due to submergence	Total area under submergence (Ha)
1	Gujarat	Dangs	Ahwa	Bhalkhet	10	18
2	Gujarat	Dangs	Ahwa	Bhongdya	98	70
3	Gujarat	Dangs	Ahwa	Bhujad	34	46
4	Gujarat	Dangs	Ahwa	Chikhala(kalibelsaj)	1	1
5	Gujarat	Dangs	Ahwa	Divadyawan	19	33
6	Gujarat	Dangs	Ahwa	Enginpada(kolbari)	41	40
7	Gujarat	Dangs	Ahwa	Godadiya	86	76
8	Gujarat	Dangs	Ahwa	Kakarda	56	48
9	Gujarat	Dangs	Ahwa	Kalibel	135	111
10	Gujarat	Dangs	Ahwa	Khatal	26	50
11	Gujarat	Dangs	Ahwa	Khopri amba	20	22
12	Gujarat	Dangs	Ahwa	Pandhrmal	76	80
13	Gujarat	Dangs	Ahwa	Patli	33	30
14	Gujarat	Dangs	Ahwa	Tekpada	69	91
15	Gujarat	Dangs	Ahwa	Wankan	14	19
Total					718	735

Table-7: Details of PAFs losing land in Paikhed Reservoir

S. No	State	District	Taluka	Village	No of PAFs losing Land due to submergence	Total area under submergence (Ha)
1	Gujarat	Valsad	Dharampur	Chavra	52	88
2	Gujarat	Valsad	Dharampur	Gundiya	81	83
3	Gujarat	Valsad	Dharampur	Khadki	69	64

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4	Gujarat	Valsad	Dharampur	Paikhed	4	6
5	Gujarat	Valsad	Dharampur	Santvankal	11	9
6	Gujarat	Valsad	Dharampur	Tutarkhed	1	1
7	Maharashtra	Nashik	Surgana	Karanjul	109	111
8	Maharashtra	Nashik	Surgana	Mangdhe (Mandha)	1	0
Total					328	362

Table-8: Summary of PAFs losing land in Chasmandva, Chikkar, Dabdar, Jheri, Kelwan, and Paikhed Reservoirs

S. No.	Reservoir	PAFs losing only land	PAFs losing land and homestead	Total No. of PAFs
1	Chasmandva	378	1	379
2	Chikkar	326	19	345
3	Dabdar	557	6	563
4	Jheri	91	7	98
5	Kelwan	718	75	793
6	Paikhed	328	3	331
Total		2398	111	2509

The information on other infrastructure facilities and community properties likely to be affected as a result of the project shall also be collected. A Resettlement & Rehabilitation (R&R) Master Plan highlighting the guidelines of land acquisition and provisions for rehabilitation measures shall be formulated. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013, Government of India shall serve as a basis for preparation of the R&R plan for the project affected families.

10. CATCHMENT AREA TREATMENT

A Catchment area Treatment Plan for catchment area intercepted at dam site upto the catchment of upstream project will be prepared as a part of the Comprehensive EIA study. The procedure for preparation of CAT plan for each watershed area to be covered is given as below:

- Catchment area Treatment Plan to be prepared using SYI method.
- Delineation of sub-watersheds in the catchment area.
- Landuse pattern using satellite data, slope map using Survey of India toposheets, etc. will be prepared.
- Mapping of critically degraded areas based on Integration of Remote Sensing technique, GIS methodology and Silt Yield Index method and prioritization Watershed treatment
- Preparation of phase wise Catchment Area Treatment (CAT) Plan for sub-watersheds with very high and high erosion intensity.
- Estimation of cost required for implementation of CAT plan.

11. DAM BREAK ANALYSIS STUDY

A dam break analysis shall be been conducted to simulate hypothetical failure of dam including preparation of inundation maps. The study shall be conducted using HEC-RAS model. A Disaster Management Plan (DMP) shall be prepared for dealing with emergency situation. It shall include emergency preparedness plan, surveillance plan, evacuation plan etc including communication system.

12. LOCAL AREA DEVELOPMENT PLAN

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As a part of the CEIA, a Local Area Development Plan (LADP) shall be formulated for implementation in study area villages. An amount of 0.5% of the project cost shall be earmarked for implementation of Local Area Development Plan

13. ENVIRONMENTAL MONITORING PROGRAMME

The Environmental Impact Assessment is basically an evaluation of future events. It is necessary to continue monitoring certain parameters identified as critical by relevant authorities under an Environmental Monitoring Programme. This would anticipate any environmental problem so as to take effective mitigation measures. An Environmental Monitoring Programme will be formulated for implementation during project construction and operation phases. The cost estimates and equipment necessary for the implementation of various measures suggested as a part of Environmental Monitoring Programme shall also be covered as a part of the EIA Study.

14. COST ESTIMATES

Cost Estimate covering following aspects shall be prepared:

- Cost of implementing Environment Management Plans
- Cost of implementing Environment Monitoring Programme
- Cost of Catchment Area Treatment Plan
- Cost of Rehabilitation & Resettlement Plan
- Cost for Local Area Development Plan
- Cost of all other compensation, mitigation and management measures