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GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
CENTRAL GROUND WATER BOARD

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND
WATER CONSERVATION IN
HINDUPUR MANDAL, ANANTAPUR DISTRICT
ANDHRA PRADESH

SOUTHERN REGION,
HYDERABAD
AUGUST-2016

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND
WATER CONSERVATION IN
HINDUPUR MANDAL, ANANTAPUR DISTRICT
ANDHRA PRADESH

CONTENTS

S.NO	TOPIC
1	INTRODUCTION
2	LOCATION
3	PHYSIOGRAPHY AND DRAINAGE
4	RAINFALL
5	LAND USE PATTERN
6	HYDROGEOLOGY
7	GROUND WATER LEVEL SCENARIO
8	DYNAMIC GROUND WATER RESOURCES
9	NEED FOR ARTIFICIAL RECHARGE AND CONSERVATION METHODS
10	JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT
11	AVAILABILITY OF SURPLUS, SURFACE WATER FOR ARTIFICIAL RECAHRGE OR CONSERVATION
12	FEASIBLE ARTIFICIAL RECHARGE STRUCTURES
13	TENTATIVE COST ESTIMATES
14	TIME SCHEDULE

AT A GLANCE

Name of the Mandal	HINDUPUR
District	ANANTAPUR
State	ANDHRA PRADESH
Total Area (Sq.kms)	267
Area suitable for Artificial Recharge (Sq.kms)	254
Latitude and Longitude	13.683350 to 13.941870 and 77.452330 to 77.651620
Average Annual Rainfall (mm)	665
Geology	Granites, Gneisses, Lime stones & Shales
Average Depth To Water Level (Decadal) (Pre Monsoon)	32.6
Average Depth To Water Level (Decadal) (Post Monsoon)	24.2
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	22.49
Net Annual Ground Water Availability(MCM)/yr	20.24
Net Annual Ground Water Draft(MCM)/yr	26.62
Projected Demand for Domestic and Industrial Use(MCM)/yr	3.57
Stage of Ground Water Development (%)	132
Surface runoff available (MCM)/yr	27.84
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	1.51
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Percolation Tanks: 0, Check Dams: 24 Farm ponds: 320, Recharge Shafts: 107
Improving Water use Efficiency	Micro Irrigation System -1600 ha
Tentative Total Cost in Lakhs (Rs.)	1305.255
Expected Recharge/Savings (MCM)/yr	6.552

1. INTRODUCTION

Hindupur Mandal is one of the over-exploited mandal in Anantapur district, Andhra Pradesh State, which is economically backward and chronically drought affected. The mandal has 16 inhabited villages and with 14 gram Panchayats.

2. LOCATION

The mandal lies between north latitudes 13.683350 to 13.941870 and between east longitudes 77.452330 to 77.651620. The mandal occupies the Southern part of the Anantapur district and is bounded on the north by Somandepalle Mandal, on the east by Lepakshi mandal, on the south by Karnataka State and west by Parigi mandal. (Fig.1)The geographical area of the mandal is 267 sq.km.

3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by streams which are tributaries of Pennar river. The streams are mostly ephemeral in nature. The drainage pattern is dendritic, rectangular to sub rectangular due to the influence of geological structures. (Fig.2)

4. RAINFALL

The average rainfall in the mandal is 665 mm. The rainfall during the South-west monsoon season i.e., June-September accounts for about 85% of the total rainfall.

5. LAND USE PATTERN

Out of the total geographical area of 267 sq.km, the area covered by forest is 12.61 sq.km and the net area sown is 40.74 sq.km. Barren and uncultivable land is 1.63 sq.km. The land for non agricultural use accounts for 58.92 sq.km.(Fig.3)

6. HYDROGEOLOGY

The Mandal is underlain by granites and granitic gneisses of Archaean age (Fig.4). The ground water in these formations occurs in the weathered and fractured zones under the water table and Semi- Confined conditions. The weathered zone thickness as per the GEC report is extending up to 9 m. The weathered zone has been extensively tapped by dug and dug cum bore wells up to 20 m depth. Ground water occurs in fractured granites down to a depth of 200 m bgl. However, the potential fractures are encountered between 50-100 m bgl. The cumulative yield varies from 2-5 lps.

7. GROUND WATER LEVEL SCENARIO

The depth to water level during pre and post-monsoon varies from 5 to 10 m bgl. The average depth to water level (decadal) during pre and post monsoon is 32.6 and 24.2 m bgl respectively. The Decadal mean water level trend during post monsoon is depicted in the Fig-5.

8. DYNAMIC GROUND WATER RESOURCES

The Ground water availability, Utilization and stage of Development in Hindupur Mandal, Ananthapur District is given in Table-1.

Table-1: Ground water resources of Hindupur Mandal, Ananthapur District.

Annual Replenishable Ground water resources (MCM)	22.49
Net Annual Ground water Availability. (MCM)	20.24
Net Annual Ground Water Draft(MCM)/yr	26.62
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	3.57
Stage of Ground water development (%).	132
Whether notified or not with year of notification.	No

9. NEED FOR ARTIFICIAL RECHARGE AND CONSERVATION METHODS

The ground water withdrawal is more than the recharge with a stage of development above hundred percent. The long term water level trend mostly shows a declining trend and the water levels are very deep ranging up to 30 m bgl. The sustainability of bore wells has become questionable as many bore wells are either drying up or have recorded reduced yields. There is no surface water irrigation facility in the area. All these factors indicate that there is an urgent need for artificial recharge and water conservation.

10. JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT

Hindupur Mandal falls under high stage of ground water development i.e., 132 % and with sufficient amount of uncommitted surface runoff. The area is completely dependent on ground water for domestic industrial and irrigation purposes. During the monsoon runoff quickly flows out of the area without natural recharge to ground water. It is necessary to apply artificial recharge techniques to allow more and more recharge through check dams, PTs, MPTs, farm ponds, recharge shafts to cope up with the withdrawal pattern and also to improve ground water situation through various interventions including on farm activities and micro irrigation systems (Sprinkler-Drip-HDPE).

11. AVAILABILITY OF SURPLUS, SURFACE WATER FOR ARTIFICIAL RECAHRGE OR CONSERVATION

The runoff was calculated by taking into account of normal rainfall of the mandal and corresponding runoff yield from Strangers table. The existing storage created by various artificial recharge structures constructed by the State Government, if any, was deducted for calculating the runoff yield to recommend new AR structures.

Total Geographical area (Sq.kms)	267
Hilly Area (Sq.kms)	13
Area suitable for Artificial Recharge (sq.km.)	254
Runoff Yield in MCM/yr.	27.84
Existing No. of Check Dams	133
Storage created MCM/yr.	0.94
Existing No. of Percolation Tanks	80
Storage created MCM/yr.	0.57
Total Existing Storage Created	1.51

12. FEASIBLE ARTIFICIAL RECHARGE STRUCTURES

Since the mandal is categorized as over exploited, there is an immediate need for improving ground water scenario and to ensure sustainability of ground water sources. It is also suggested to create additional storage capacity of surface water bodies which would result in supplementing irrigation thereby reducing the ground water draft. The runoff available in the mandal has been assessed as 26.33 MCM/yr, which could be considered for further planning of artificial recharge. However, the number of artificial recharge structures feasible has been recommended in areas, by considering the utilizable yield, number of existing structures, land use, drainage pattern and also where the post monsoon water levels (decadal mean) are more than 5 m bgl., and or decadal trends are either falling or showing insignificant raising trend.

A) Check dams and Percolation Tanks

The area is covered by seasonal nalas – drains, which carry discharge during monsoon period debauched into the water bodies within a short duration. It is proposed to identify such nalas for construction of check dams/Percolation tank with recharge shafts, so as to harness ground water and to increase soil moisture content.

- The site selected for check dam/Percolation Tank should have sufficient thickness of permeable soils or weathered material to facilitate recharge of stored water within a short span of time. The water stored in these structures is mostly confined to the stream course and height is normally less than 2m.
- These are designed based on stream width and excess water is allowed to flow over the crest wall. In order to avoid scouring from excess runoff water cushions are provided on the downstream side. To harness maximum runoff in the stream, a series of such check dams can be constructed to have recharge on a regional scale.
- Considering the annual monsoon rainfall of 665 mm sufficient rain water can be harnessed. This will improve ground water regime as well as delaying the instant flow into the main river.
- The flow in these seasonal rivers can be sustained up to about 2 to 3 months after monsoon.

- Recharge trenches can also be constructed along upstream side of the check dam/Percolation Tank in the impoundment area for enhancing the ground water recharge rates.

Thus, **24 Check dams** are recommended.

B). Recharge Shafts

The existing check dams and percolation tanks lose their storage capacity as well as recharge capacity due to siltation. Hence, Recharge shafts are recommended in the existing Check dams and Percolation tanks to enhance the ground water recharge. During the heavy downpours, there will be sufficient accumulation of runoff, which can also effectively be utilized for recharge by constructing recharge shafts. Hence, it is proposed to construct 67 and 40 recharge shafts of 165 mm dia with 30 m depth in the existing check dams and percolation tanks respectively.

C). Farm Ponds

A farm pond is a large dug out in the earth, usually square or rectangular in shape, which harvests rainwater and stores it for future use. It has an inlet to regulate inflow and an outlet to discharge excess water. The pond is surrounded by a small bund, which prevents erosion on the banks of the pond. The size and depth depend on the amount of land available, the type of soil water from the farm pond is conveyed to the fields manually, by pumping, or by both methods.

Advantages of Farm Ponds

- They provide water to start growing crops, without waiting for rain to fall.
- They provide irrigation water during dry spells between rainfalls. This increases the yield, the number of crops in one year, and the diversity of crops that can be grown.
- Bunds can be used to raise vegetables and fruit trees, thus supplying the farm household with an additional source of income and of nutritious food.
- Farmers are able to apply adequate farm inputs and perform farming operations at the appropriate time, thus increasing their productivity and their confidence in farming.
- They check soil erosion and minimize siltation of waterways and reservoirs.
- They supplies water for domestic purposes and livestock
- They promote fish rearing.
- They recharge the ground water.
- They improve drainage.

- The excavated earth has a very high value and can be used to enrich soil in the fields, levelling land, and constructing farm roads.

As per the Land use classification, majority of the area is covered by the agricultural field. Hence, it is proposed to construct 320 farm ponds in 16 villages of the Mandal @ 20 farm ponds in each village.

D). Micro Irrigation System (Sprinkler /drip/HDPE pipes)

Micro irrigation is defined as the frequent application of small quantities of water directly above and below the soil surface; usually as discrete drops, continuous drops or tiny streams through emitters placed along a water delivery line. In flood/furrow irrigation method more than 50% of applied water is wasted through seepage to deeper level, localized inundation causes loss through evaporation and it leaches out the nutrients from the plant. While through drip & sprinkler irrigation wastages of irrigational water could be minimized. The studies on different crops, has revealed that irrigation water is saved drastically. The conveyance losses (mainly seepage & evaporation) can be saved up to 25 to 40% through utilization of HDPE pipes. Initially the scheme is proposed to be implemented in worst affected areas showing deepest water levels and significant declining trends. It is proposed to take up micro irrigation system in 1600 ha @ 100 ha per village.

13. TENTATIVE COST ESTIMATES (HINDUPUR MANDAL)

S.No.	Feasible Artificial Recharge & Water Conservation structures/	No. of Structures/ Quantity	Total Volume (MCM)	Tentative unit cost (in Rs lakh)	Total tentative cost (in Rs Lakh)	Expected Annual GW Recharge/ Savings (MCM)
1	Proposed Masonry Check dams Crest Length -10-15 m, Height-1-2 m) (0.007 MCM*4 fillings)	24	0.672	5	120	0.504
2	Recharge shaft in Check dam (50% of the existing Check dams)	67	0.737	0.5	33.5	0.737
3	Proposed Percolation Tanks (100*100*2.5)* 4 fillings)	0	0	15	0	0
4	Renovation Desilting, Repairs and installation of Recharge Shafts in existing PTS (50% of the existing PTS)	40	0.44	1	40	0.44
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	320	0.04608	0.25	80	0.041472
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	1600	9.6	0.6	960	4.8
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	16	0	0.6	9.6	0
8 (i)	Total (No. of AR Structures)	467	1.90		283.1	1.722
8 (ii)	Total (ha)	1600			960	4.8
	Total (8(i) + 8 (ii))				1243.1	6.522
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				62.155	
	Grand Total				1305.255	

*(Expected annual GW Recharge/Savings MCM - CDS& PTS: 75%, Farm ponds - 90%, Sprinklers-50%, Recharge shafts in existing CDS and PTS-100%)

Note: The type, number and cost of structure may vary according to site, after the ground truth verification.

14. TIME SCHEDULE

Steps	Quarters							
	1st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
Identification of line department/implementing agency and preparation of DPR								
Approval of Scheme and releases of sanction of funds								
Implementation of ARS								

Phase = one quarter or 3 months or equivalent to financial quarter

A). Operation and Maintenance

In all projects impact assessment has to be carried out to ensure that project is economically viable, socially equitable and environmentally sustainable by inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. Accordingly it is proposed to have impact assessment as well as operation & Maintenance at the rate of 5% of the total cost of the project for 5 years from the completion of artificial recharge project.

B). Expected Benefits

The benefits of the project are:

1. The implementation of the project would result in additional recharge/Ground water savings to the tune of 6.522 MCM.
2. Ground water recharge will help in arresting the rapid decline in ground water resources and will also ensure improvement in quality of ground water by dilution.
3. Proposed structures and measures will also enhance the ground water potential and would ensure sustainability of ground water resources. It is estimated that the stage of ground water development may likely to be reduced from the present 132% to 99% (33%)
4. It will also help in controlling soil erosion.

Acknowledgements

The data received from the Director Ground Water Department Andhra Pradesh in respect of the basic inputs is duly acknowledged. The information on existing Artificial Recharge Structures have been taken from the EMUSTER, Department of Rural Development, Government of AP.

EXTISTING ARTIFICIAL RECHARGE STRUCTURES
HINDUPUR MANDAL, ANANTAPUR DISTRICT AP.

S.no	Gram Panchayat	Habitation	Structure Type	Longitude	Latitude	Scheme
1	Manesamudram	Manesamudram	Check Dam	77.5310	13.8753	NREGS
2	Manesamudram	Manesamudram	Check Dam	77.5345	13.8730	NREGS
3	Manesamudram	Manesamudram	Check Dam	77.5282	13.8784	NREGS
4	Maluguru	Maluguru	Check Dam	77.5401	13.8970	NREGS
5	Maluguru	Maluguru	Check Dam	77.5373	13.8937	NREGS
6	Maluguru	Maluguru	Check Dam	77.5421	13.8991	NREGS
7	Maluguru	Maluguru	Check Dam	77.5420	13.8963	NREGS
8	Maluguru	Maluguru	Check Dam	77.5449	13.8971	NREGS
9	Maluguru	Maluguru	Check Dam	77.5730	13.8895	NREGS
10	Maluguru	Maluguru	Check Dam	77.5489	13.9006	NREGS
11	Maluguru	Maluguru	Check Dam	77.5612	13.8987	NREGS
12	Maluguru	Maluguru	Check Dam	77.5692	13.8930	NREGS
13	Balampalli	Balampalli	Check Dam	77.6042	13.9064	NREGS
14	Balampalli	Balampalli	Check Dam	77.6021	13.9054	NREGS
15	Balampalli	Balampalli	Check Dam	77.6003	13.9050	NREGS
16	Balampalli	Balampalli	Check Dam	77.6050	13.9055	NREGS
17	Balampalli	Cherlopally	Check Dam	77.6315	13.9084	NREGS
18	Balampalli	Cherlopally	Check Dam	77.6214	13.9105	NREGS
19	Balampalli	Cherlopally	Check Dam	77.6188	13.9163	NREGS
20	Balampalli	Cherlopally	Check Dam	77.6081	13.9135	NREGS
21	Balampalli	Cherlopally	Check Dam	77.6285	13.8991	NREGS
22	Balampalli	Cherlopally	Check Dam	77.6152	13.9074	NREGS
23	Balampalli	Cherlopally	Check Dam	77.6294	13.9070	NREGS
24	Balampalli	Cherlopally	Check Dam	77.6272	13.9047	NREGS
25	Balampalli	Cherlopally	Check Dam	77.6131	13.9109	NREGS
26	Balampalli	Cherlopally	Check Dam	77.6104	13.9123	NREGS
27	Balampalli	Jamgalapally	Check Dam	77.5978	13.9095	NREGS
28	Balampalli	Jamgalapally	Check Dam	77.5881	13.9054	NREGS
29	Beerepalli	Beerepalli	Check Dam	77.5637	13.8645	NREGS
30	Beerepalli	Beerepalli	Check Dam	77.5746	13.8760	NREGS
31	Beerepalli	Beerepalli	Check Dam	77.5870	13.8700	NREGS
32	Beerepalli	Beerepalli	Check Dam	77.5867	13.8721	NREGS
33	Beerepalli	Beerepalli	Check Dam	77.5935	13.8699	NREGS
34	Beerepalli	Chinnaguddampalli	Check Dam	77.5608	13.8640	NREGS
35	Beerepalli	Chinnaguddampalli	Check Dam	77.5606	13.8658	NREGS
36	Beerepalli	Chinnaguddampalli	Check Dam	77.5515	13.8752	NREGS
37	Beerepalli	Peddaguddampalli	Check Dam	77.5469	13.8713	NREGS
38	Beerepalli	Peddaguddampalli	Check Dam	77.5456	13.8717	NREGS
39	Beerepalli	Peddaguddampalli	Check Dam	77.5447	13.8654	NREGS
40	Beerepalli	Peddaguddampalli	Check Dam	77.5548	13.8601	NREGS
41	Chalivendala	Rachepally	Check Dam	77.5882	13.9054	NREGS

42	Chalivendala	Rachepally	Check Dam	77.5908	13.8739	NREGS
43	Chalivendala	Rachepally	Check Dam	77.5968	13.8807	NREGS
44	Thumukunta	Devarapalle	Check Dam	77.5041	13.7382	NREGS
45	Thumukunta	Devarapalle	Check Dam	77.5013	13.7327	NREGS
46	Thumukunta	Devarapalle	Check Dam	77.4888	13.7381	NREGS
47	Thumukunta	Devarapalle	Check Dam	77.5008	13.7321	NREGS
48	Thumukunta	Thumakunta	Check Dam	77.5088	13.7223	NREGS
49	Thumukunta	Thumakunta	Check Dam	77.5073	13.7187	NREGS
50	Chowlur	Karudipalli	Check Dam	77.4620	13.7035	NREGS
51	Chowlur	Karudipalli	Check Dam	77.4548	13.6994	NREGS
52	Chowlur	Ramachandrapuram	Check Dam	77.4673	13.7081	NREGS
53	Chowlur	Venkatapuram	Check Dam	77.4625	13.6867	NREGS
54	Kotipi	Kenchinapalli	Check Dam	77.5203	13.7496	NREGS
55	Kotipi	Kotipi	Check Dam	77.5133	13.7464	NREGS
56	Kotipi	Kotipi	Check Dam	77.5077	13.7540	NREGS
57	Kotipi	Kotipi	Check Dam	77.5123	13.7608	NREGS
58	Kaggallu	K.Narasapuram	Check Dam	77.5290	13.8304	NREGS
59	Kaggallu	Kottakhagallu	Check Dam	77.5331	13.8612	NREGS
60	Kaggallu	Kottakhagallu	Check Dam	77.5328	13.8543	NREGS
61	Kaggallu	Kottakhagallu	Check Dam	77.5311	13.8465	NREGS
62	Kaggallu	Kottakhagallu	Check Dam	77.5455	13.8520	NREGS
63	Kaggallu	Kottakhagallu	Check Dam	77.5422	13.8517	NREGS
64	Kaggallu	Kottakhagallu	Check Dam	77.5418	13.8572	NREGS
65	Kaggallu	Subbireddypalli	Check Dam	77.5431	13.8454	NREGS
66	Kaggallu	Subbireddypalli	Check Dam	77.5491	13.8507	NREGS
67	Bevinahalli	Nakkalapalle	Check Dam	77.4679	13.7627	NREGS
68	Bevinahalli	Sanjeevarayanipally	Check Dam	77.4663	13.7910	NREGS
69	Bevinahalli	Sanjeevarayanipally	Check Dam	77.4659	13.7915	NREGS
70	Kirikera	A.Vaddipalli	Check Dam	77.4882	13.7537	NREGS
71	Kirikera	A.Vaddipalli	Check Dam	77.4914	13.7579	NREGS
72	Kirikera	Appalakunta	Check Dam	77.5006	13.7518	NREGS
73	Kirikera	Appalakunta	Check Dam	77.5025	13.7516	NREGS
74	Kirikera	Appalakunta	Check Dam	77.4953	13.7511	NREGS
75	Kirikera	Kirikera	Check Dam	77.4871	13.7677	NREGS
76	Kirikera	Kirikera	Check Dam	77.4936	13.7622	NREGS
77	Kirikera	Kirikera	Check Dam	77.4947	13.7620	NREGS
78	Kirikera	Kirikera	Check Dam	77.4989	13.7596	NREGS
79	Kirikera	Vinayaka Nagar	Check Dam	77.4950	13.7718	NREGS
80	Kirikera	Vinayaka Nagar	Check Dam	77.4985	13.7714	NREGS
81	Kirikera	Vinayaka Nagar	Check Dam	77.4965	13.7691	NREGS
82	Kirikera	Vinayaka Nagar	Check Dam	77.4938	13.7750	NREGS
83	Manesamudram	Manesamudram	Check Dam	77.5310	13.8753	IWMP
84	Manesamudram	Manesamudram	Check Dam	77.5345	13.8730	IWMP
85	Manesamudram	Manesamudram	Check Dam	77.5282	13.8784	IWMP

86	Maluguru	Maluguru	Check Dam	77.5401	13.8970	IWMP
87	Maluguru	Maluguru	Check Dam	77.5373	13.8937	IWMP
88	Maluguru	Maluguru	Check Dam	77.5421	13.8991	IWMP
89	Maluguru	Maluguru	Check Dam	77.5420	13.8963	IWMP
90	Maluguru	Maluguru	Check Dam	77.5449	13.8971	IWMP
91	Maluguru	Maluguru	Check Dam	77.5730	13.8895	IWMP
92	Maluguru	Maluguru	Check Dam	77.5489	13.9006	IWMP
93	Maluguru	Maluguru	Check Dam	77.5612	13.8987	IWMP
94	Maluguru	Maluguru	Check Dam	77.5692	13.8930	IWMP
95	Balampalli	Balampalli	Check Dam	77.6042	13.9064	IWMP
96	Balampalli	Balampalli	Check Dam	77.6021	13.9054	IWMP
97	Balampalli	Balampalli	Check Dam	77.6003	13.9050	IWMP
98	Balampalli	Balampalli	Check Dam	77.6050	13.9055	IWMP
99	Balampalli	Cherlopally	Check Dam	77.6315	13.9084	IWMP
100	Balampalli	Cherlopally	Check Dam	77.6294	13.9070	IWMP
101	Balampalli	Cherlopally	Check Dam	77.6272	13.9047	IWMP
102	Balampalli	Cherlopally	Check Dam	77.6214	13.9105	IWMP
103	Balampalli	Cherlopally	Check Dam	77.6188	13.9163	IWMP
104	Balampalli	Cherlopally	Check Dam	77.6081	13.9135	IWMP
105	Balampalli	Cherlopally	Check Dam	77.6285	13.8991	IWMP
106	Balampalli	Cherlopally	Check Dam	77.6152	13.9074	IWMP
107	Balampalli	Cherlopally	Check Dam	77.6131	13.9109	IWMP
108	Balampalli	Cherlopally	Check Dam	77.6104	13.9123	IWMP
109	Balampalli	Jamgalapally	Check Dam	77.5978	13.9095	IWMP
110	Balampalli	Jamgalapally	Check Dam	77.5881	13.9054	IWMP
111	Beerepalli	Beerepalli	Check Dam	77.5746	13.8760	IWMP
112	Beerepalli	Beerepalli	Check Dam	77.5870	13.8700	IWMP
113	Beerepalli	Beerepalli	Check Dam	77.5867	13.8721	IWMP
114	Beerepalli	Beerepalli	Check Dam	77.5637	13.8645	IWMP
115	Beerepalli	Beerepalli	Check Dam	77.5935	13.8699	IWMP
116	Beerepalli	Chinnaguddampalli	Check Dam	77.5608	13.8640	IWMP
117	Beerepalli	Chinnaguddampalli	Check Dam	77.5606	13.8658	IWMP
118	Beerepalli	Chinnaguddampalli	Check Dam	77.5515	13.8752	IWMP
119	Beerepalli	Peddaguddampalli	Check Dam	77.5469	13.8713	IWMP
120	Beerepalli	Peddaguddampalli	Check Dam	77.5456	13.8717	IWMP
121	Beerepalli	Peddaguddampalli	Check Dam	77.5447	13.8654	IWMP
122	Beerepalli	Peddaguddampalli	Check Dam	77.5548	13.8601	IWMP
123	Balampalli	Cherlopally	Check Wall	77.6193	13.9065	NREGS
124	Beerepalli	Beerepalli	Check Wall	77.5826	13.8716	NREGS
125	Chalivendala	Rachepally	Check Wall	77.5881	13.8846	NREGS
126	Kotipi	Kenchinapalli	Check Wall	77.5178	13.7500	NREGS
127	Kotipi	Kotipi	Check Wall	77.5064	13.7540	NREGS
128	Kotipi	Kotipi	Check Wall	77.5058	13.7541	NREGS
129	Kotipi	Kotipi	Check Wall	77.5099	13.7594	NREGS

130	Kaggallu	Kottakhagallu	Check Wall	77.5414	13.8559	NREGS
131	Bevinahalli	BevinaHalli	Check Wall	77.4671	13.7716	NREGS
132	Balampalli	Cherlopally	Check Wall	77.6193	13.9065	IWMP
133	Beerepalli	Beerepalli	Check Wall	77.5826	13.8716	IWMP
134	Gollapuram	Gollapuram	MPT	77.5173	13.7263	NREGS
135	Gollapuram	Gollapuram	MPT	77.5170	13.7197	NREGS
136	Maluguru	Maluguru	MPT	77.5455	13.8955	NREGS
137	Balampalli	Cherlopally	MPT	77.6076	13.9122	NREGS
138	Balampalli	Cherlopally	MPT	77.6030	13.9153	NREGS
139	Balampalli	Cherlopally	MPT	77.6088	13.9112	NREGS
140	Balampalli	Cherlopally	MPT	77.6074	13.9108	NREGS
141	Balampalli	Cherlopally	MPT	77.6067	13.9127	NREGS
142	Pulakunta	Maravapalli	MPT	77.5247	13.8132	NREGS
143	Thumukunta	Thumakunta	MPT	77.4957	13.7161	NREGS
144	Santhebidanur	Santhebidanur	MPT	77.4660	13.7270	NREGS
145	Santhebidanur	Santhebidanur	MPT	77.4695	13.7206	NREGS
146	Chowlur	Chowlur	MPT	77.4712	13.6963	NREGS
147	Chowlur	Ramachandrapuram	MPT	77.4707	13.7158	NREGS
148	Chowlur	Venkatapuram	MPT	77.4707	13.6891	NREGS
149	Kotipi	Kenchinapalli	MPT	77.5188	13.7489	NREGS
150	Kotipi	Kotipi	MPT	77.5098	13.7439	NREGS
151	Kotipi	Kotipi	MPT	77.5120	13.7457	NREGS
152	Kotipi	Kotipi	MPT	77.5132	13.7438	NREGS
153	Kotipi	Kotipi	MPT	77.5183	13.7444	NREGS
154	Kotipi	Kotipi	MPT	77.5134	13.7620	NREGS
155	Kotipi	Kotipi	MPT	77.5110	13.7602	NREGS
156	Kotipi	Kotipi	MPT	77.5089	13.7599	NREGS
157	Kaggallu	Subbireddypalli	MPT	77.5472	13.8457	NREGS
158	Bevinahalli	BevinaHalli	MPT	77.4677	13.7856	NREGS
159	Bevinahalli	BevinaHalli	MPT	77.4706	13.7865	NREGS
160	Bevinahalli	BevinaHalli	MPT	77.4620	13.7903	NREGS
161	Bevinahalli	BevinaHalli	MPT	77.4701	13.7869	NREGS
162	Bevinahalli	Nakkalapalle	MPT	77.4674	13.7639	NREGS
163	Maluguru	Maluguru	MPT	77.5455	13.8955	IWMP
164	Balampalli	Cherlopally	MPT	77.6076	13.9122	IWMP
165	Balampalli	Cherlopally	MPT	77.6030	13.9153	IWMP
166	Balampalli	Cherlopally	MPT	77.6088	13.9112	IWMP
167	Balampalli	Cherlopally	MPT	77.6074	13.9108	IWMP
168	Balampalli	Cherlopally	MPT	77.6067	13.9127	IWMP
169	Maluguru	Maluguru	PT	77.5464	13.8952	NREGS
170	Maluguru	Maluguru	PT	77.5521	13.8955	NREGS
171	Maluguru	Maluguru	PT	77.5617	13.8982	NREGS
172	Balampalli	Balampalli	PT	77.6089	13.9056	NREGS
173	Balampalli	Balampalli	PT	77.6135	13.8976	NREGS

174	Balampalli	Cherlopally	PT	77.6287	13.9102	NREGS
175	Balampalli	Cherlopally	PT	77.6165	13.9093	NREGS
176	Balampalli	Cherlopally	PT	77.6042	13.9149	NREGS
177	Balampalli	Cherlopally	PT	77.5993	13.9160	NREGS
178	Balampalli	Cherlopally	PT	77.6057	13.9151	NREGS
179	Balampalli	Cherlopally	PT	77.6144	13.9159	NREGS
180	Balampalli	Cherlopally	PT	77.6122	13.9117	NREGS
181	Balampalli	Cherlopally	PT	77.6096	13.9105	NREGS
182	Chalivendala	Rachepally	PT	77.5871	13.9047	NREGS
183	Chalivendala	Rachepally	PT	77.5855	13.9001	NREGS
184	Pulakunta	Maravapalli	PT	77.5229	13.8175	NREGS
185	Thumukunta	Devarapalle	PT	77.4853	13.7408	NREGS
186	Chowlur	Karudipalli	PT	77.4645	13.7031	NREGS
187	Chowlur	Karudipalli	PT	77.4568	13.6978	NREGS
188	Chowlur	Ramachandrapuram	PT	77.4709	13.7077	NREGS
189	Chowlur	Ramachandrapuram	PT	77.4775	13.7123	NREGS
190	Kotipi	Kotipi	PT	77.5105	13.7433	NREGS
191	Kotipi	Kotipi	PT	77.5079	13.7512	NREGS
192	Kaggallu	K.Narasapuram	PT	77.5252	13.8326	NREGS
193	Kaggallu	Kottakhagallu	PT	77.5381	13.8609	NREGS
194	Kaggallu	Kottakhagallu	PT	77.5435	13.8576	NREGS
195	Kaggallu	Kottakhagallu	PT	77.5423	13.8487	NREGS
196	Bevinahalli	BevinaHalli	PT	77.4649	13.7769	NREGS
197	Bevinahalli	BevinaHalli	PT	77.4567	13.7777	NREGS
198	Bevinahalli	Nakkalapalli	PT	77.4670	13.7653	NREGS
199	Bevinahalli	Sanjeevarayanipally	PT	77.4661	13.7962	NREGS
200	Kirikera	A.Vaddipalli	PT	77.5021	13.7570	NREGS
201	Maluguru	Maluguru	PT	77.5464	13.8952	IWMP
202	Maluguru	Maluguru	PT	77.5521	13.8955	IWMP
203	Maluguru	Maluguru	PT	77.5617	13.8982	IWMP
204	Balampalli	Balampalli	PT	77.6089	13.9056	IWMP
205	Balampalli	Balampalli	PT	77.6135	13.8976	IWMP
206	Balampalli	Cherlopally	PT	77.6287	13.9102	IWMP
207	Balampalli	Cherlopally	PT	77.6042	13.9149	IWMP
208	Balampalli	Cherlopally	PT	77.5993	13.9160	IWMP
209	Balampalli	Cherlopally	PT	77.6057	13.9151	IWMP
210	Balampalli	Cherlopally	PT	77.6144	13.9159	IWMP
211	Balampalli	Cherlopally	PT	77.6165	13.9093	IWMP
212	Balampalli	Cherlopally	PT	77.6122	13.9117	IWMP
213	Balampalli	Cherlopally	PT	77.6096	13.9105	IWMP

PROPOSED ARTIFICIAL RECHARGE STRUCTURES
HINDUPUR MANDAL, ANANTAPUR DISTRICT AP.

S.No.	Mandal	Lattitude	Longitude	Structure_Type
1	Hindupur	13.8721	77.5182	CheckDam
2	Hindupur	13.8483	77.5099	CheckDam
3	Hindupur	13.8048	77.4921	CheckDam
4	Hindupur	13.9213	77.5750	CheckDam
5	Hindupur	13.8893	77.6425	CheckDam
6	Hindupur	13.9247	77.6250	CheckDam
7	Hindupur	13.9113	77.6428	CheckDam
8	Hindupur	13.7737	77.5192	CheckDam
9	Hindupur	13.7775	77.4789	CheckDam
10	Hindupur	13.7481	77.4821	CheckDam
11	Hindupur	13.7161	77.5266	CheckDam
12	Hindupur	13.7966	77.4769	CheckDam
13	Hindupur	13.8627	77.5170	CheckDam
14	Hindupur	13.7694	77.5347	CheckDam
15	Hindupur	13.7036	77.4853	CheckDam
16	Hindupur	13.7327	77.4850	CheckDam
17	Hindupur	13.7055	77.5292	CheckDam
18	Hindupur	13.7913	77.4866	CheckDam
19	Hindupur	13.6898	77.4850	CheckDam
20	Hindupur	13.8887	77.5318	CheckDam
21	Hindupur	13.9012	77.5579	CheckDam
22	Hindupur	13.9225	77.5441	CheckDam
23	Hindupur	13.9329	77.5860	CheckDam
24	Hindupur	13.8790	77.6347	CheckDam

Fig.1

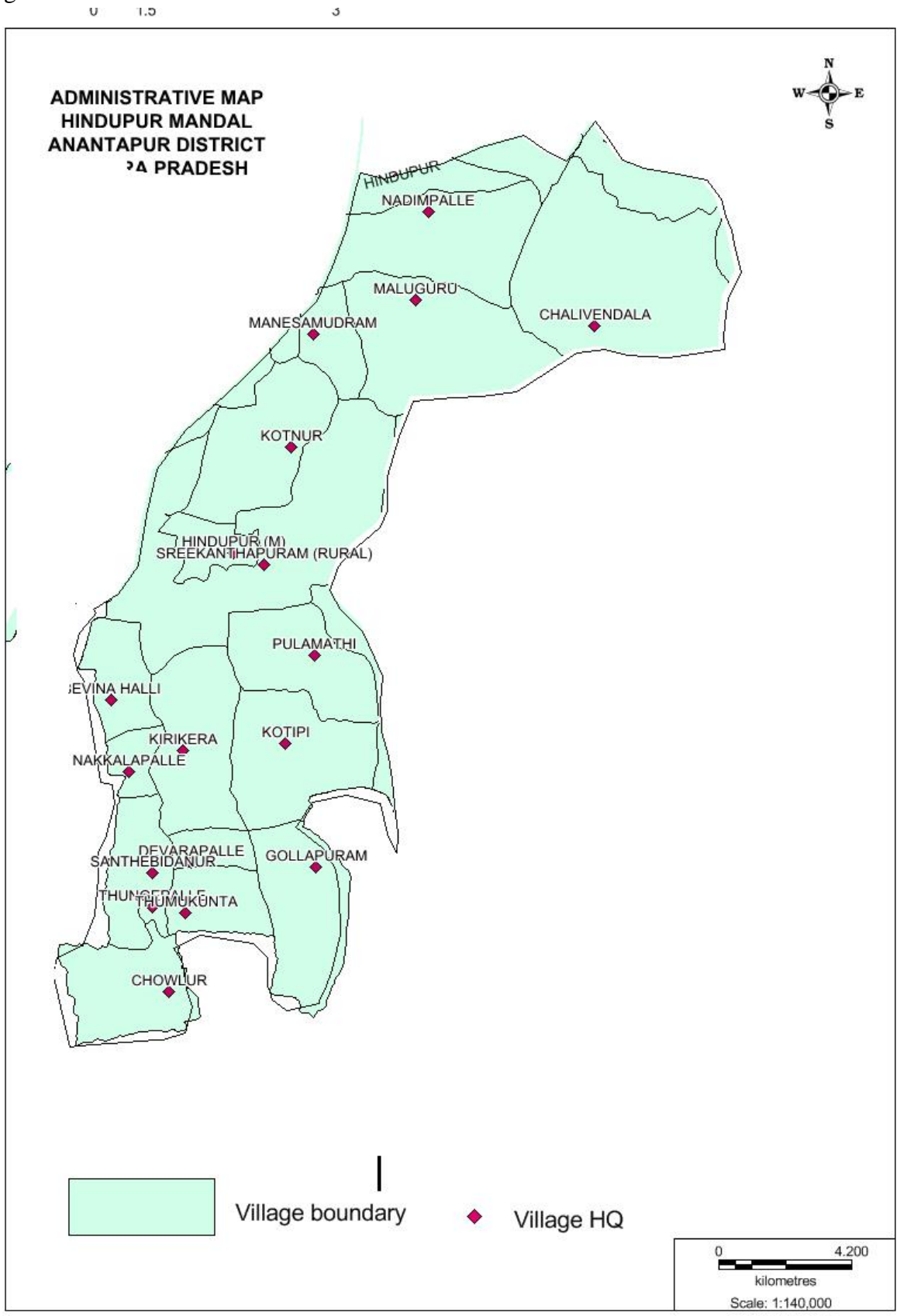


Fig.2

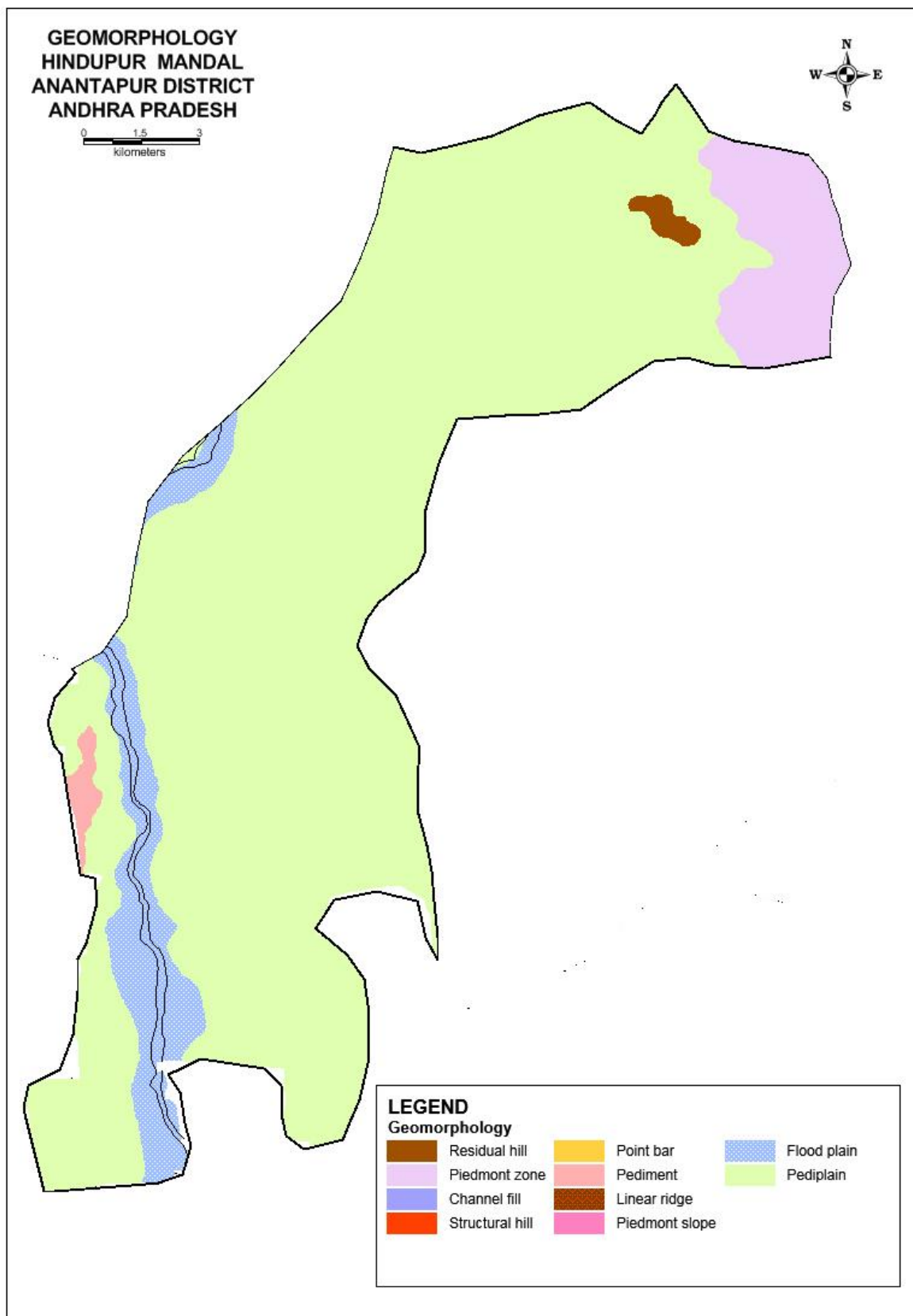


Fig.3

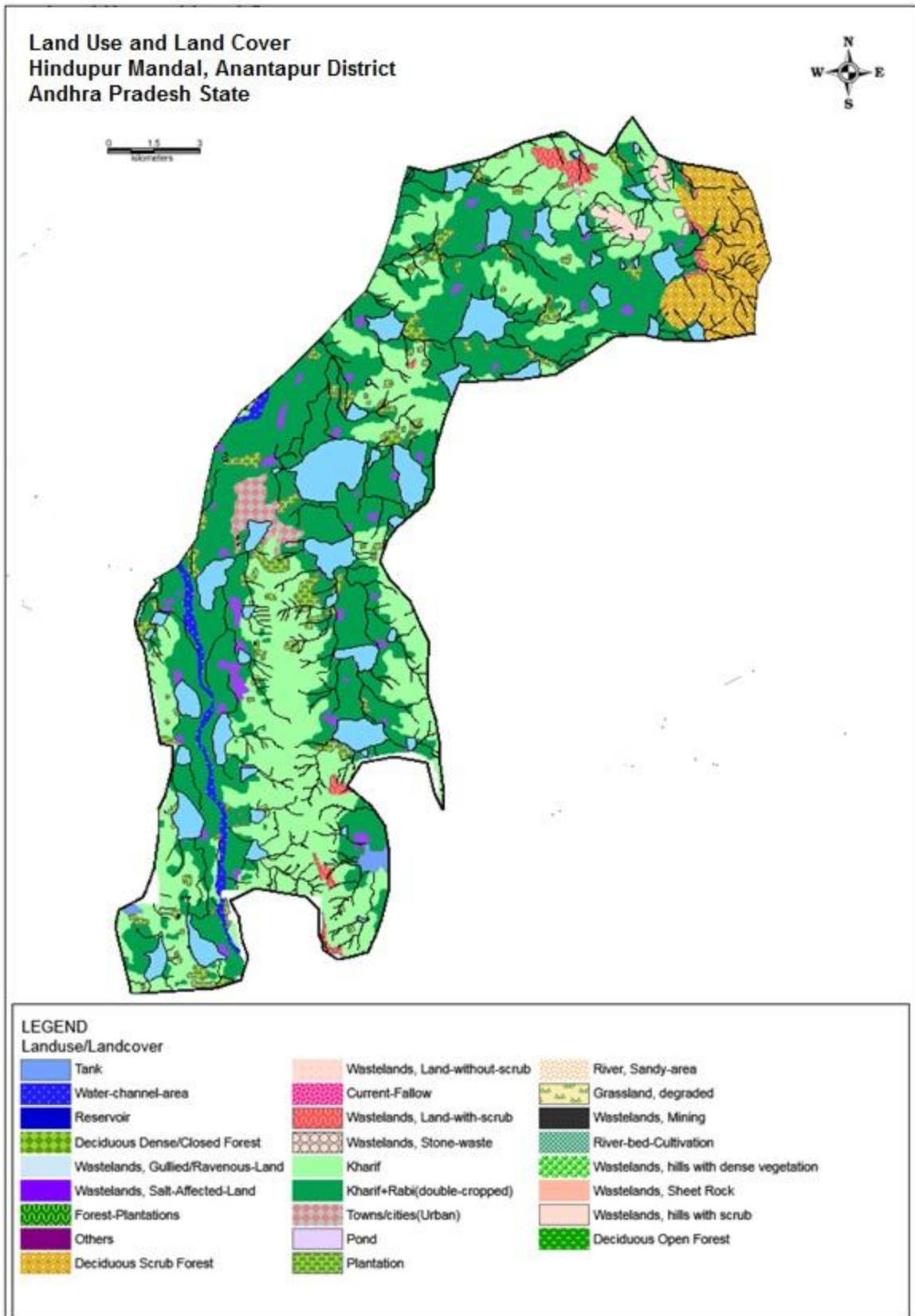


Fig.4

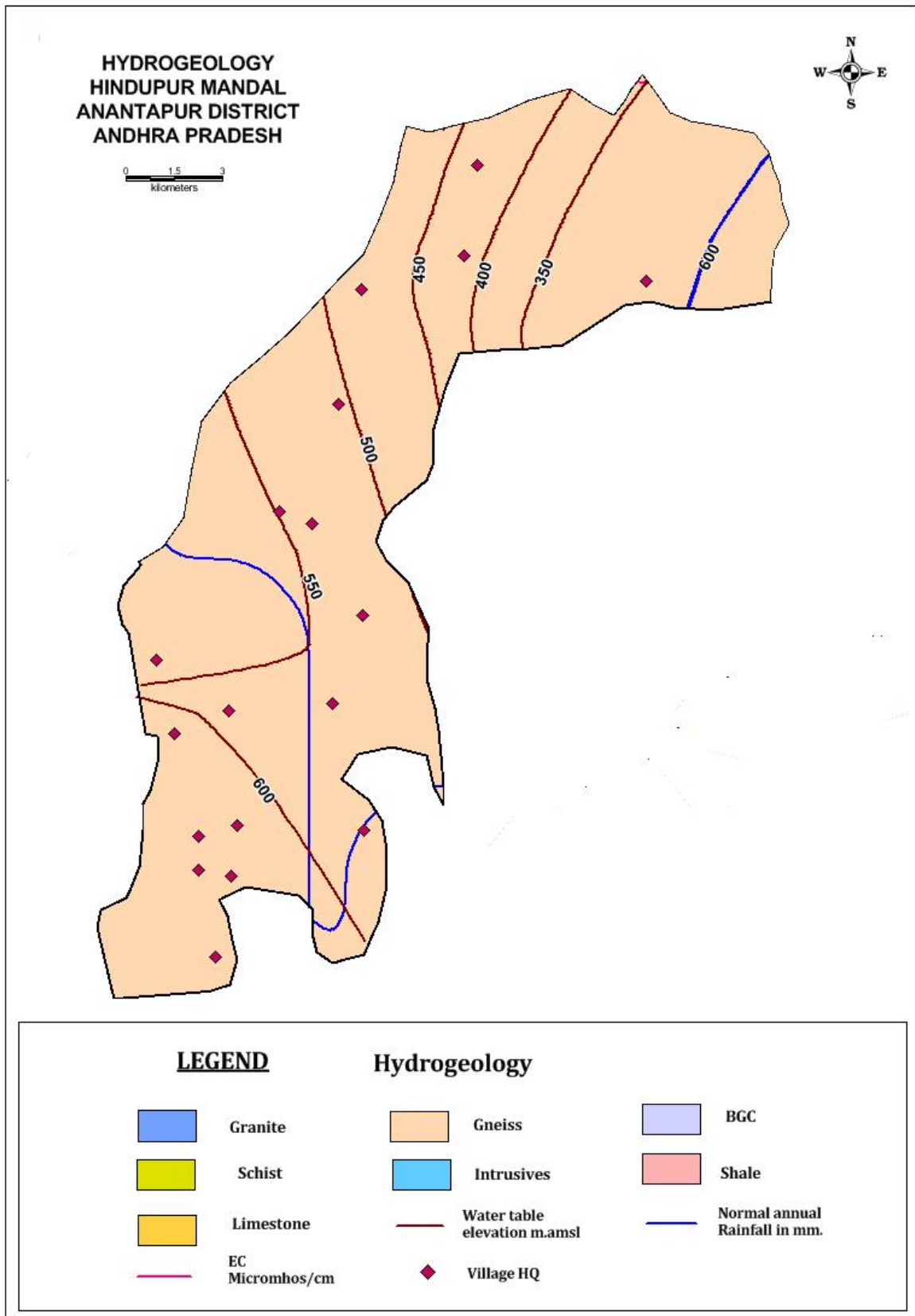


Fig.5

