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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 GANGADHARA MANDAL, KARIMNAGAR  
DISTRICT, TELANGANA STATE

SOUTHERN REGION,  
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PLAN ON  
ARTIFICIAL RECHARGE TO GROUNDWATER AND  
WATER CONSERVATION IN GANGADHARA MANDAL,  
KARIMNAGAR DISTRICT, TELANGANA STATE

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**AT A GLANCE**

Name of the Mandal	GANGADHARA
District	KARIMNAGAR
State	TELANGANA
Total Area(sq. km)	163
Area suitable for Artificial Recharge (Sq.kms)	141.6
Latitude and Longitude	18.411250 to 18.663930 and 78.946000 to 79.038320.
Average Annual Rainfall (mm)	915
Geology	BGC
Average Depth To Water Level (Decadal) (Pre Monsoon)	20.01
Average Depth To Water Level (Decadal) (Post Monsoon)	14.46
<b>Ground Water Resources (2011)</b>	
Annual Replenishable Ground Water Resources (MCM/yr)	32.68
Net Annual Ground Water Availability(MCM)/yr	20.76
Net Annual Ground Water Draft(MCM)/yr	23.40
Projected Demand for Domestic and Industrial Use(MCM)/yr	0.54
Stage of Ground Water Development (%)	113
Runoff Yield in MCM/yr	32.5
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	0
<b>Artificial Recharge/Conservation Measures</b>	
Recharge Structures Proposed (No.s)	Percolation Tanks-4 Check Dams-40 Farm Ponds - 460
Improving Water use Efficiency	Micro Irrigation – 2300 ha
Tentative Total Cost in Lakhs (Rs.)	1857
Expected Recharge/Savings (MCM)/yr	8.1

## 1. INTRODUCTION

Gangadhara Mandal is one of the over-exploited Mandal in Karimnagar district, Telangana State, which is economically backward and chronically drought affected. The Mandal has 19 inhabited villages and with 23 gram panchayats.

## 2. LOCATION

The Mandal lies between north latitudes 18.411250 to 18.663930 and between east longitudes 78.946000 to 79.038320. The Mandal occupies the middle part of the Karimnagar district and is bounded on the north by Pegadapalle mandal, on the east by Choppadandi mandal, on the south by Ramadugu mandal and west by Kodimal Mandal. (Fig.1) The geographical area of the Mandal is 163 sq.km.

## 3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by streams, falling in Manneru sub-basin of Godavari basin. 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 915 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 163 sq.km, the area under forest is 0.94 sq.km. and the net area sown is 81.11 sq.km. Barren and uncultivable land is 3.14 sq.km. The land for non agricultural use accounts for 4.16 sq.km.(Fig.3).

## 6. HYDROGEOLOGY

The area is underlain by granitic gneisses of Archaean age (Fig-4). Ground water occurs in weathered and fractured zones under water table and semi- confined conditions. The weathered zone thickness as per the GEC report is 25m. The weathered zone has been extensively tapped by dug and dug cum bore wells up to 25 m depth, which are mostly dry now. Ground water occurs in the 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. The average depth to water level (decadal) during pre and post monsoon is 20.01 and 14.46 m bgl respectively.

## 7. GROUND WATER LEVEL SCENARIO

The depth to water level during pre and post-monsoon varies from 5 to 20 mbgl.. 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 Gangadhara Mandal Karimnagar District is given in the Table-1.

Table-1: Ground water resources of Gangadhara Mandal, Karimnagar District.

Annual Replenishable Ground water resources (MCM)	32.68
Net Annual Ground Water Availability(MCM)/yr	20.76
Net Annual Ground Water Draft(MCM)/yr	23.40
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	0.54
Stage of Ground water development (%).	113
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 upto 20mbgl. 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 in the Mandal.

## 10. JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT

Gangadhara Mandal falls under high stage of ground water development i.e., 113 % and with sufficient amount of uncommitted surface runoff. The area is completely dependent on ground water for domestic, industrial and irrigation purposes. During the monsoons 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)	163
Hilly Area (Sq.kms)	21.4
Area suitable for Artificial Recharge (sq.km.)	141.6
Runoff Yield in MCM/yr	32.5
Existing No. of Check Dams	0
Storage created MCM/yr	0
Existing No. of Percolation Tanks	0
Storage created MCM/yr	0
Total Existing Storage Created	0

## 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 run off available for ground water recharge purpose within the mandal has been assessed as 32.5 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 915 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 rate.

**A Total of 40 Check dams and 4 Percolation tanks are recommended.**

## **B) Farm Pond**

A farm pond is a large dug out in the earth, usually square or rectangular in shape, which harvests rain water 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 460 farm ponds in 23 villages of the Mandal @ 20 farm ponds in each village.

### **C). 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 2300 ha @ 100 ha per village.



13.

## TENTATIVE COST ESTIMATES (GANGADHARA 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)	40	1.12	5	200	0.84
2	Recharge shaft in Check dam (50% of the existing Check dams)	0	0	0.5	0	0
3	Proposed Percolation Tanks (100*100*2.5)* 4 fillings)	4	0.4	15	60	0.3
4	Renovation Desilting, Repairs and installation of Recharge Shafts in existing PTS (50% of the existing PTS)	0	0	1	0	0
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	460	0.06624	0.25	115	0.059616
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	2300		0.6	1380	6.9
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	23	0	0.6	13.8	0
8 (i)	Total (No. of AR Structures)	527	1.59		388.8	1.200
8 (ii)	Total (ha)	2300			1380	6.9
	Total (8(i) + 8 (ii))				<b>1768.8</b>	<b>8.1</b>
9	Impact Assessment & O & M -5 % of Total cost of the Scheme				<b>88.44</b>	
	<b>Grand Total</b>				<b>1857.24</b>	

\*(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	Quarter							
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>
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 8.1 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 113% to 81% (32%)
4. It will also help in controlling soil erosion.

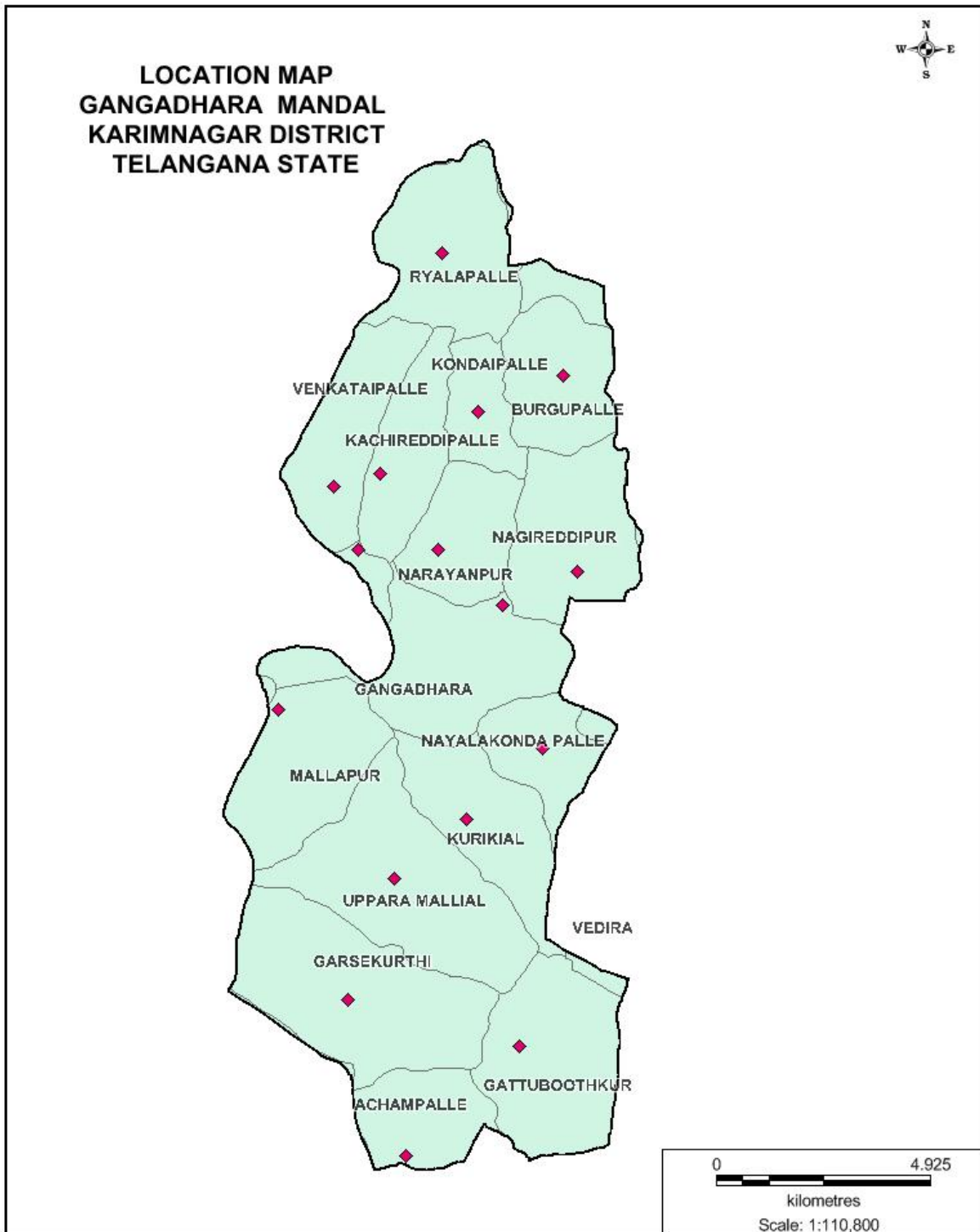
#### **Acknowledgements**

The inputs with regard to the Utilizable Yield, existing and proposed Artificial Recharge Structures have been provided by the Director, State Ground Water Department, Government of Telangana. The same is duly acknowledged.

PROPOSED ARTIFICIAL RECHARGE STRUCTURES IN  
GANGADHARA MANDAL, KARIMNAGAR DISTRICT, TELANGANA.

S. No.	Villages Name	Lattitude	Longitude	Structure type
1	ACHAMPALLE	18.467	78.987	CD
2	BURGUPALLE	18.633	79.031	CD
3	BURGUPALLE	18.633	79.020	CD
4	BURGUPALLE	18.617	79.026	CD
5	BURGUPALLE	18.633	79.020	CD
6	BURGUPALLE	18.617	79.019	CD
7	BURGUPALLE	18.650	79.025	CD
8	GANGADHARA	18.567	78.007	CD
9	GARSEKURTHI	18.500	78.968	CD
10	GARSEKURTHI	18.483	78.951	CD
11	GARSEKURTHI	18.500	78.976	CD
12	GATTUBOOTHKUR	18.500	79.008	CD
13	GATTUBOOTHKUR	18.483	79.015	CD
14	ISLAMPUR	18.600	78.977	CD
15	KACHIREDDIPALLE	18.600	78.999	CD
16	KACHIREDDIPALLE	18.600	78.995	CD
17	KONDAIPALLE	18.633	79.004	CD
18	KONDAIPALLE	18.633	78.994	CD
19	KONDAIPALLE	18.617	78.997	CD
20	KURIKIAL	18.567	78.994	CD
21	KURIKIAL	18.533	78.999	CD
22	KURIKIAL	18.533	78.017	CD
23	MALLAPUR	18.567	78.962	CD
24	MALLAPUR	18.550	78.969	CD
25	MALLAPUR	18.533	78.966	CD
26	NAGIREDDIPUR	18.583	78.023	CD
27	NAGIREDDIPUR	18.600	78.015	CD
28	NAGIREDDIPUR	18.600	78.024	CD
29	NARASIMHULAPALLE	18.633	78.067	CD
30	NARASIMHULAPALLE	18.633	78.070	CD
31	NARAYANPUR	18.583	78.995	CD
32	NAYALAKONDA	18.533	79.020	CD
33	RYALAPALLE	18.650	79.002	CD
34	RYALAPALLE	18.650	79.003	CD
35	SARVAREDDIPALLE	18.617	79.074	CD
36	UPPARAMALLIAL	18.533	78.982	CD
37	UPPARAMALLIAL	18.517	78.963	CD
38	UPPARAMALLIAL	18.517	78.971	CD
39	UPPARAMALLIAL	18.517	78.991	CD
40	VENKATAIPALLE	18.617	78.980	CD
41	GATTUBOOTHKUR	18.517	79.201	PT
42	NARASIMHULAPALLE	18.633	78.080	PT
43	RYALAPALLE	18.650	79.015	PT
44	RYALAPALLE	18.650	79.014	PT

Fig.1



**LEGEND**

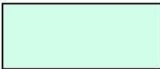

-  Village boundary
-  Village HQ

Fig.2

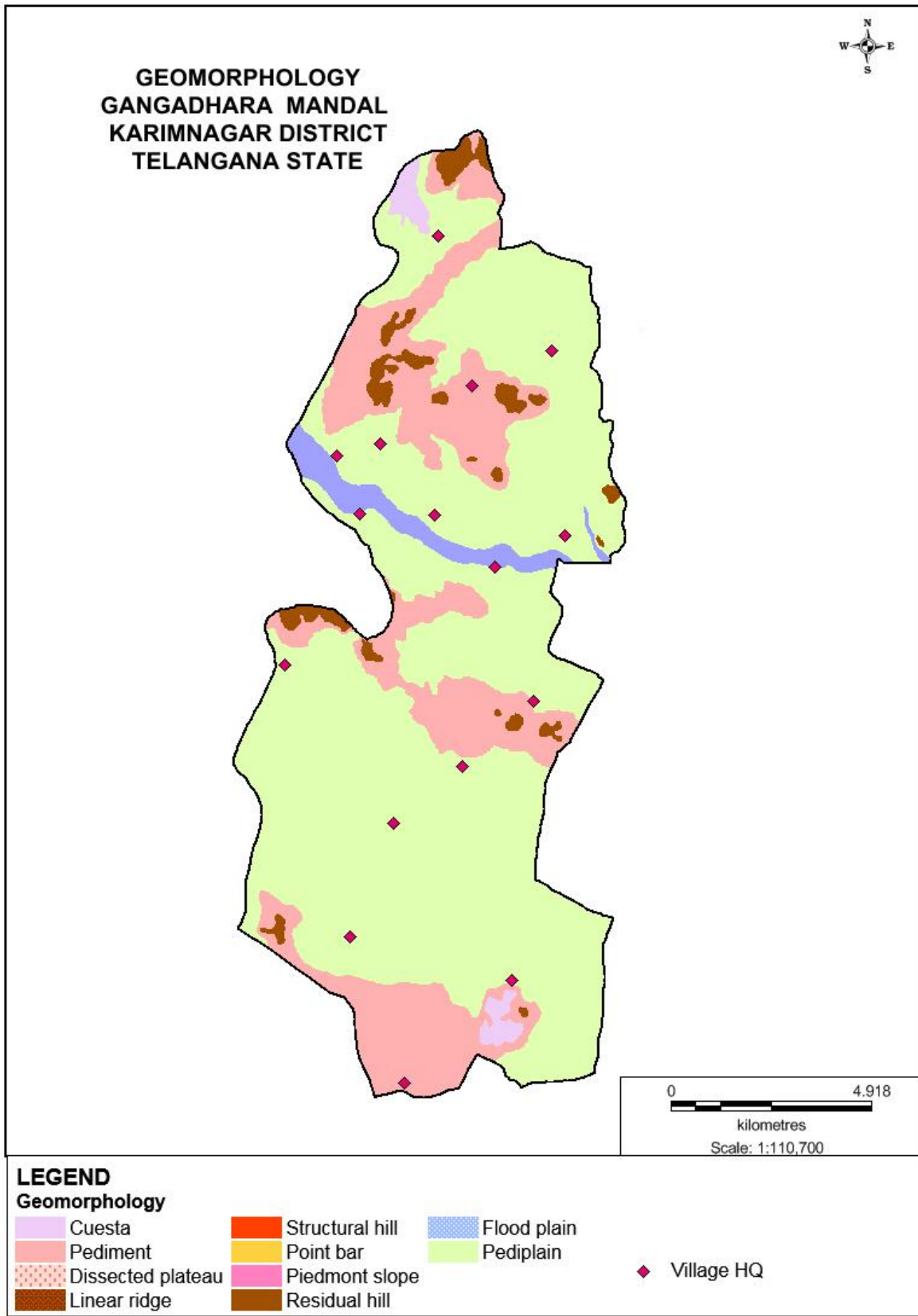


Fig.3

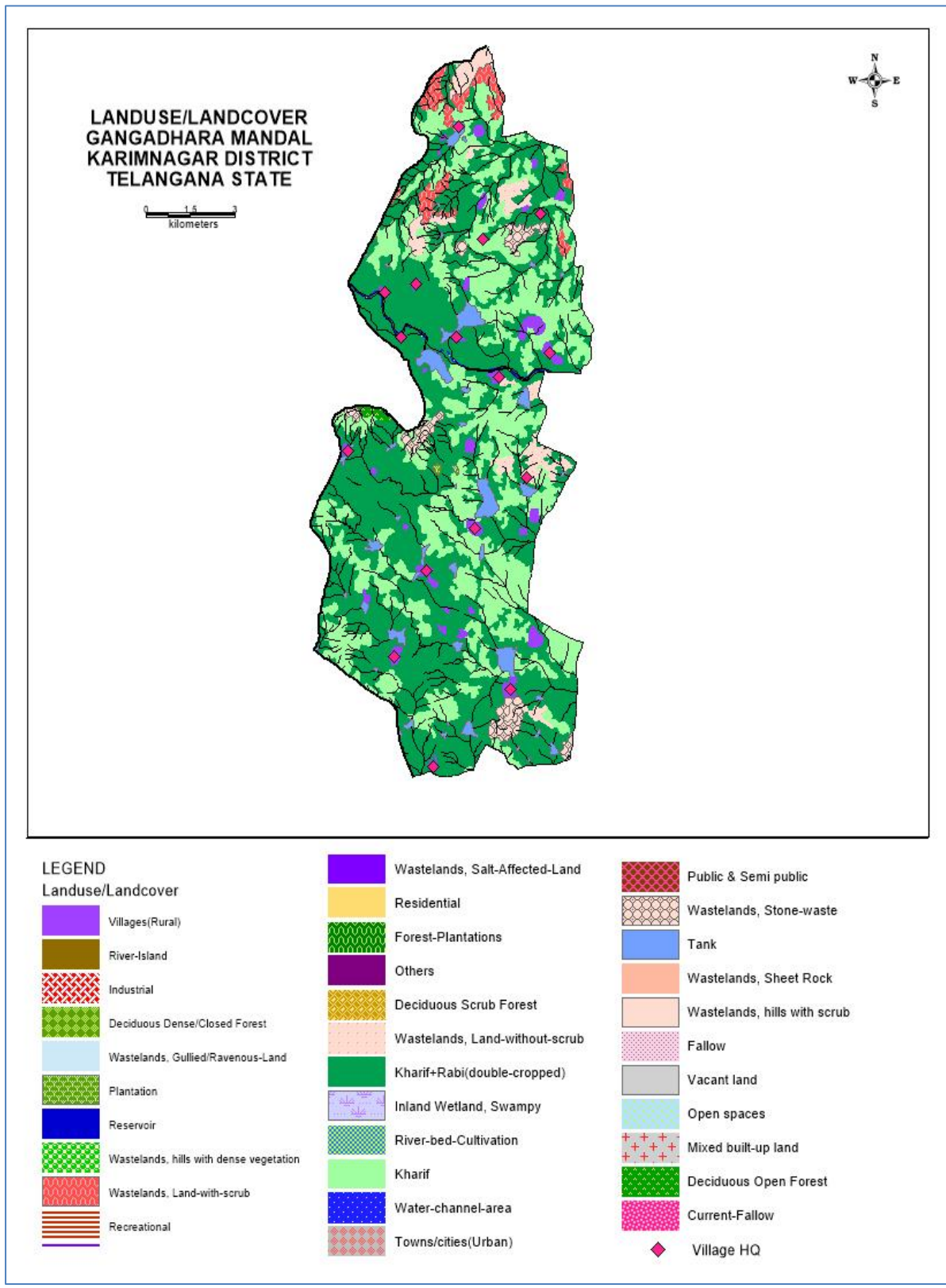


Fig.4

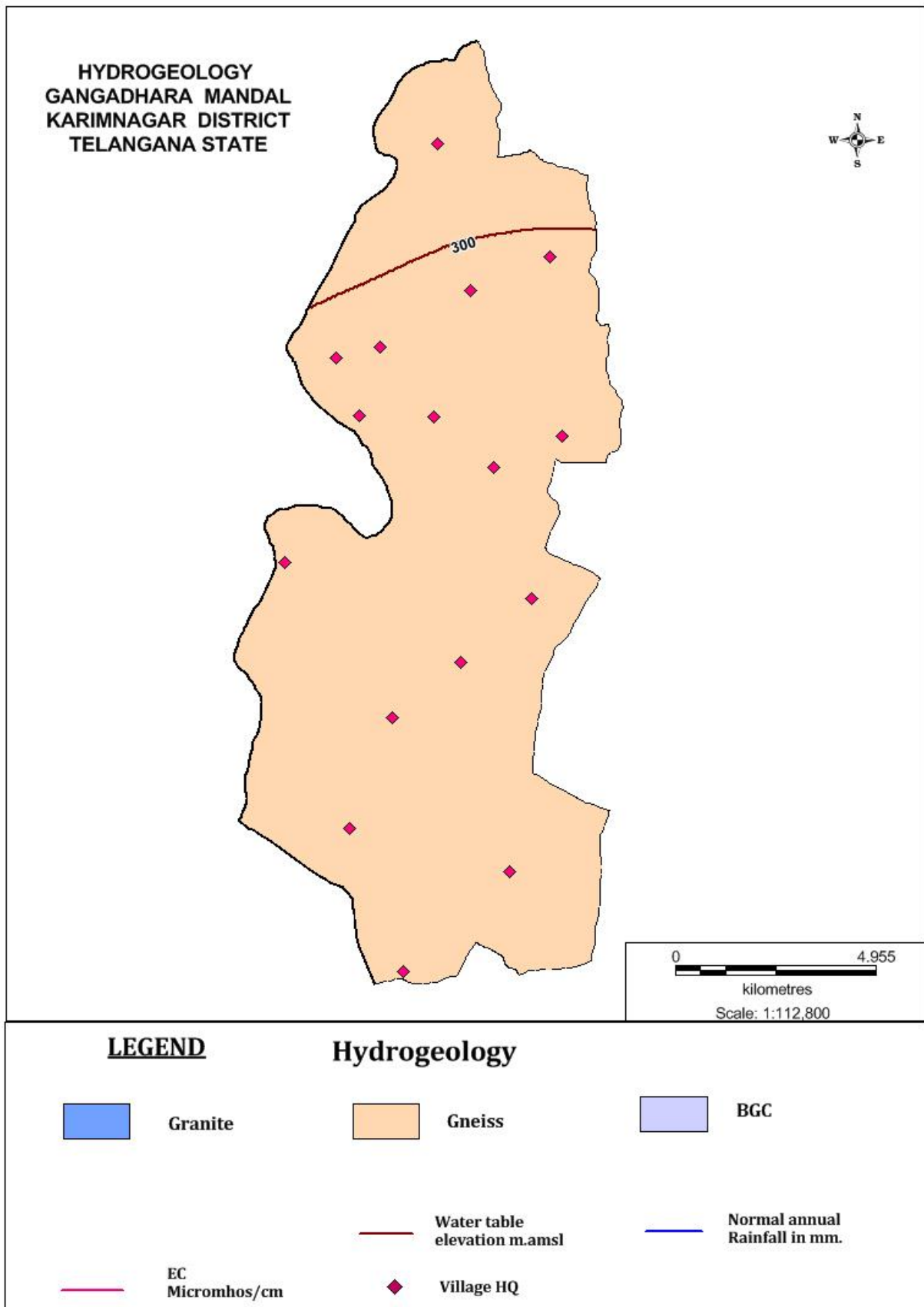


Fig.5

