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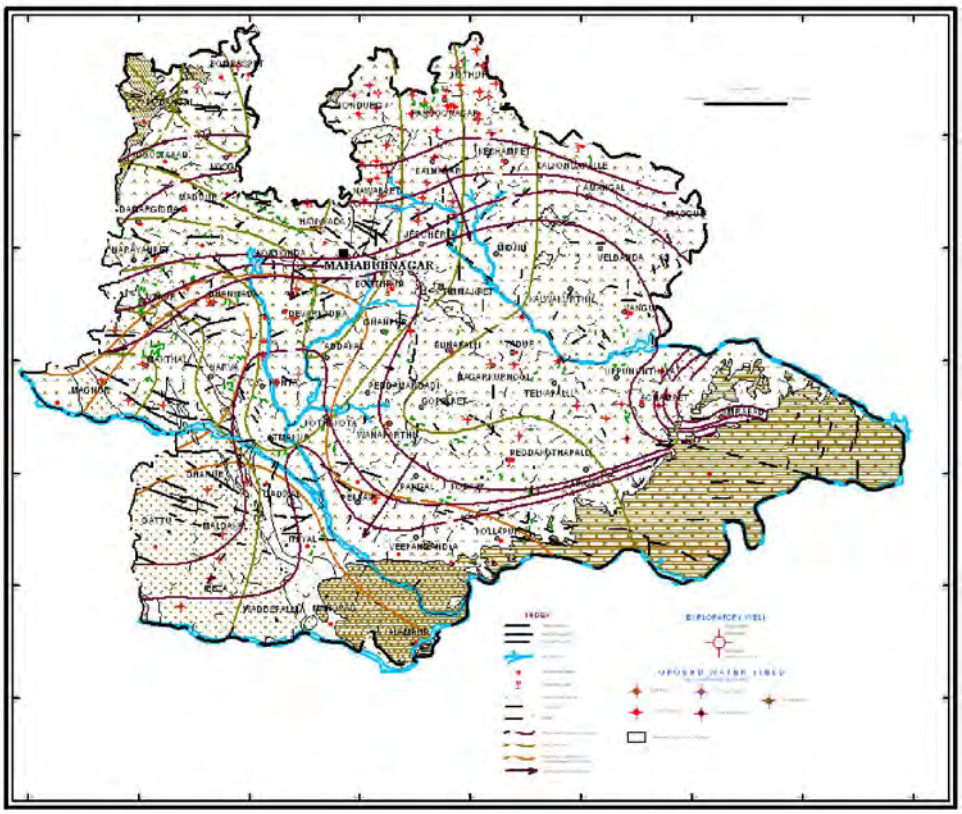
CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES
GOVERNMENT OF INDIA

GROUND WATER BROCHURE
MAHABUBNAGAR DISTRICT, ANDHRA PRADESH



SOUTHERN REGION
HYDERABAD
September 2013

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MAHABUBNAGAR DISTRICT, ANDHRA PRADESH

By

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GROUND WATER BROCHURE
MAHABUBNAGAR DISTRICT, ANDHRA PRADESH

C O N T E N T S

DISTRICT AT A GLANCE

1. GENERAL

Location	North Latitude	15^0 55'00" and	17^0 20'00"
	East Longitude	77^0 15'00"and	79^0 15'00"
Geographical area (sq.km)			18,400
Headquarters		Mahabubnagar	
No. of revenue mandals			64
No. of revenue villages			1549
Population (2011)	Urban		3,71,355
	Rural		31,42,579
Total			35,13,934
Population density (persons/sq.km)			219
Major rivers		Krishna	
		Tungabhadra	

2. RAINFALL

Normal annual rainfall	605 mm
Annual rainfall (2012)	633 mm

Soils	Red sandy soils
	sandy loam soils
	black soils
Agroclimatic zone	Southern plateau
	and hill zone no.10
	(South Telangana zone)

3. LAND USE (2012) (Area in ha.)

Forest	255596
Barren and uncultivated	88530
Cultivable waste	19856
Current fallows	305668
Net area sown	863653

4. IRRIGATION (2012) (Area in ha.)

Source of irrigation	
Canals	31058
Tanks	3346
Dug wells	4169
Bore / Tube wells	209093
Others	8572
Net Irrigated	2,56,238
Gross area irrigated	3,30,217

Major irrigation projects	Priyadarshini
	Jurala project
Medium irrigation projects	4
	1. RDS canal,
	2. Koilsagar
	3. Ookashettivagu
	project
	4. Savala sagar

5. GEOLOGY

Major rock types	Granite & gneisses
	Limestones
	Shales, Basalt

6. GROUND WATER

Deep tube / bore wells Exploration by CGWB	93
Monitoring	
No. of observation wells	
Dug wells	
Piezometers Manual	
Range of water levels (Pre-monsoon-2012)	3 to 20m bgl
Range of water levels (Post monsoon-2012)	1.52 to 19.20 m bgl

7. GROUND WATER RESOURCES (MCM)

Command Area
Non-command Area
Stage of ground water development

8. GROUND WATER DEVELOPMENT CATEGORY

No. of mandals categorised as

Safe (<70 % of net available resource)	53
Semi Critical (70 - 90 %)	11
Critical (90 - 100 %) Over exploited (> 100 %)	--

9. CHEMICAL QUALITY (Dug well zone)

Electrical Conductivity (micro Siemens / cm at 25 deg. C) - 673 to 3100

Chloride - 53 to 567 (mg/l)

Fluoride- 0.28 to 2.4 (mg/l)

Nitrate- 5 to 504 (mg/l)

GROUND WATER BROCHURE
MAHABUBNAGAR DISTRICT, ANDHRA PRADESH

1.0 INTRODUCTION

Mahabubnagar is the second largest district in Andhra Pradesh in terms of area (18432.00 sq. km) covered. It is also known as Palamoor. Mahabubnagar district headquarters town was named after Mir Mahabub Ali Khan, the Nizam of Hyderabad. North Latitudes 77° 55′ 00’ and 17° 20’ 00” and East longitudes 77° 15’ 00″ and covered in the Survey of India topographical maps no 56G and 56K. It is bounded on the north by Ranga Reddy and Nalgonda districts, on the east by Nalgonda and Guntur districts, on the south by the rivers Krishna and Tungabhadra and on the west by Raichur and Gulbarga districts of Karnataka State. The area of the district is 18,432 sq. kms. The district having four(4) revenue divisions and 64 Mandals and 1554 revenue villages, with Headquarters at Mahabubnagar town lies between The district is well connected with road, rail and telecommunication as well (Fig.1 (A) & (B)).

In 2011, the district has a population of 4,042,191 of which male and female were 2,046,247 and 1,995,944 respectively. In 2001 census, Mahabubnagar had a population of 3,513,934 of which males were 1,782,340 and remaining 1,731,594 were females. Mahabubnagar District population constituted 4.77 percent of total Maharashtra population. The initial provisional data released by census India 2011, shows that density of Mahabubnagar district for 2011 is 219 people per sq. km. Population of Mahabubnagar District (Comparison 2001 & 2011 census) is given in Fig.2.

The district is mainly covered by three types of soils Viz. red sandy soil (Dubbas and Chalkas) Red earth (with loamy sub-soils and Chalkas) and black cotton soils. Red sandy soils and red earth are permeable and well drained.

Fig : 1(A): Location map of Mahabubnagar District, A.P

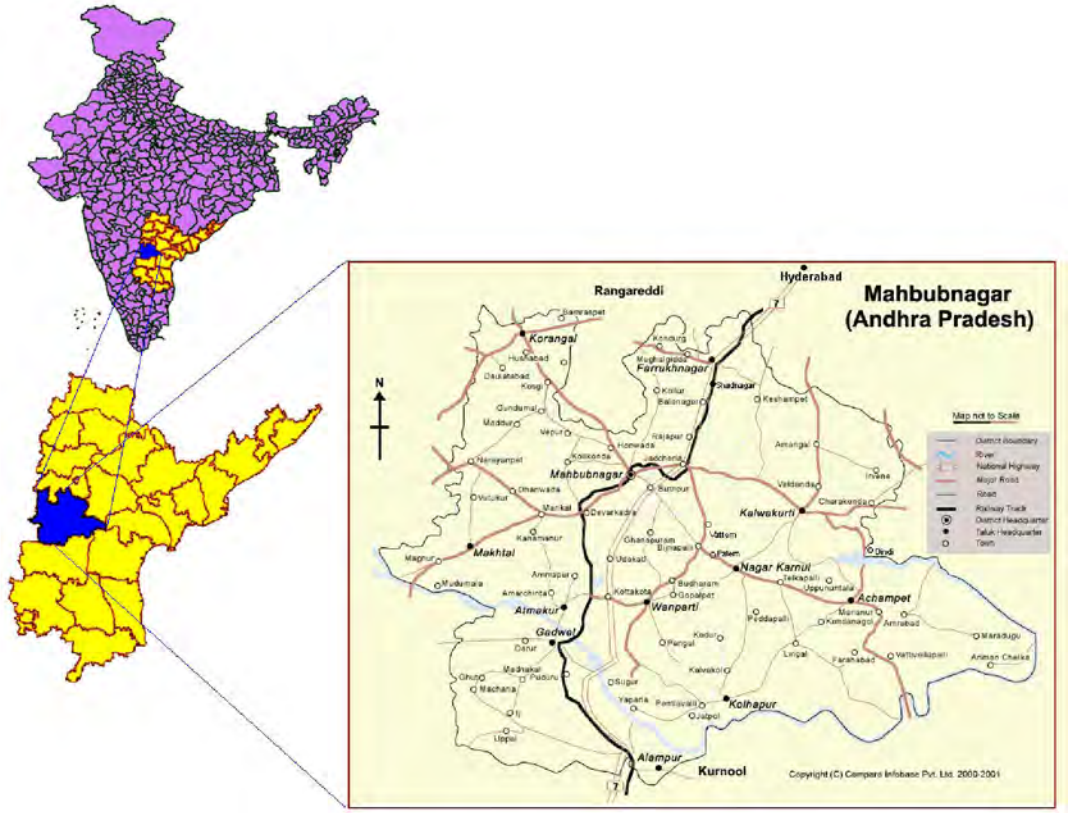
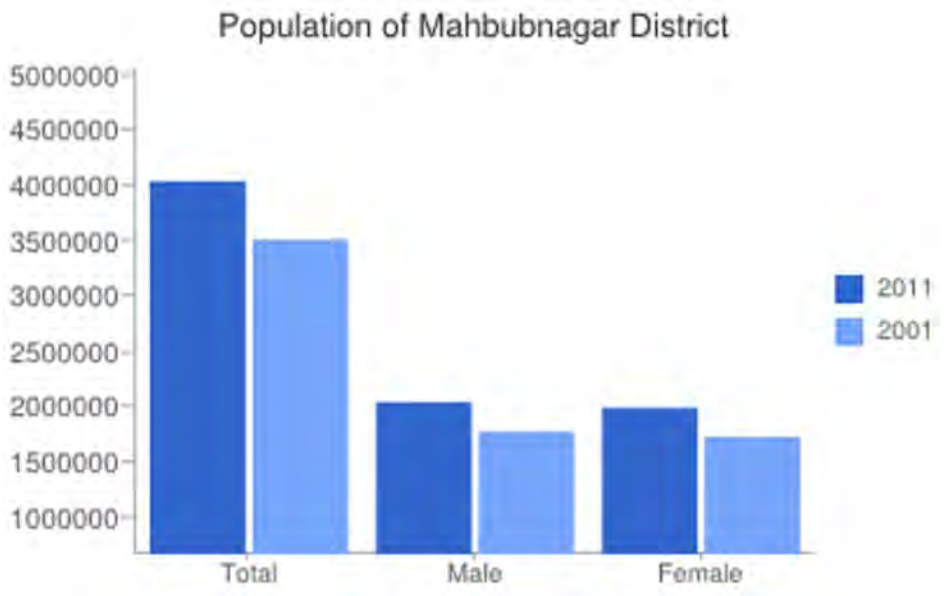


Table : 1

District Population Analysis		
	STATE	**DISTRICT**
Population	**8,46,65,533**	**40,42,191**
Decadal increase	**84,55,526**	**5,28,257**
Growth Rate %	**11.10**	**15.03**
Highest Growth Rate %	**48.15 Ranga Reddy**	**36.18 Kodair**
Lowest Growth Rate %	**3.45 West Godavari**	**-0.48 Tadoor**
Literacy Percentage	**67.77**	**56.05**
Decadal Literacy Growth	**7.3**	**11.65**
Highest Literacy	**80.96 Hyderabad**	**64.87 Alampur**
Lowest Literacy	**56.06 MBNR**	**34.45 Ghattu**
Sex Ratio	**992**	**975**
Highest Sex Ratio	**1038 Nizamabad**	**1017 Kodangal**
Lowest Sex Ratio	**943 Hyderabad**	**924 Amangal**
Density	**308**	**219**

Fig : 1(B): Administrative Divisions of Mahabubnagar District, A.P

Fig : 2: Population of Mahabubnagar District (Comparison 2001 & 2011 census)



Drainage:

The entire district lies in Krishna river basin. The district is covered by eight major watersheds viz., Magnur vagu basin, Musi basin, Upper Krishna basin, Dind basin, Tungabhadra basin, Okachetty basin, Kagna basin and Lower Krishna basin. The Krishna and Tungabhadra are two principal rivers that flow through the district. The Krishna river flows through Gadwal, Atmakur, Wanaparthy, Alampur and Achampet mandals whereas Tungabhadra meanders through Taluks of Gedwal and Alampur. River Dindi, a tributary of Krishna traverses through Kalwakurthi and Achampet areas and Koilsagar is another tributary to Krishna river. Peddavagu and Chinnavagu are small tributaries to Krishna. The water divide runs in west-north west to east and south west through the catchment of Krishna and Tungabhadra rivers. The water divide separate the Krihna and Koilsagar basins in the North East-South East districts. The district is divided into 49 micro basins.

Land Use:

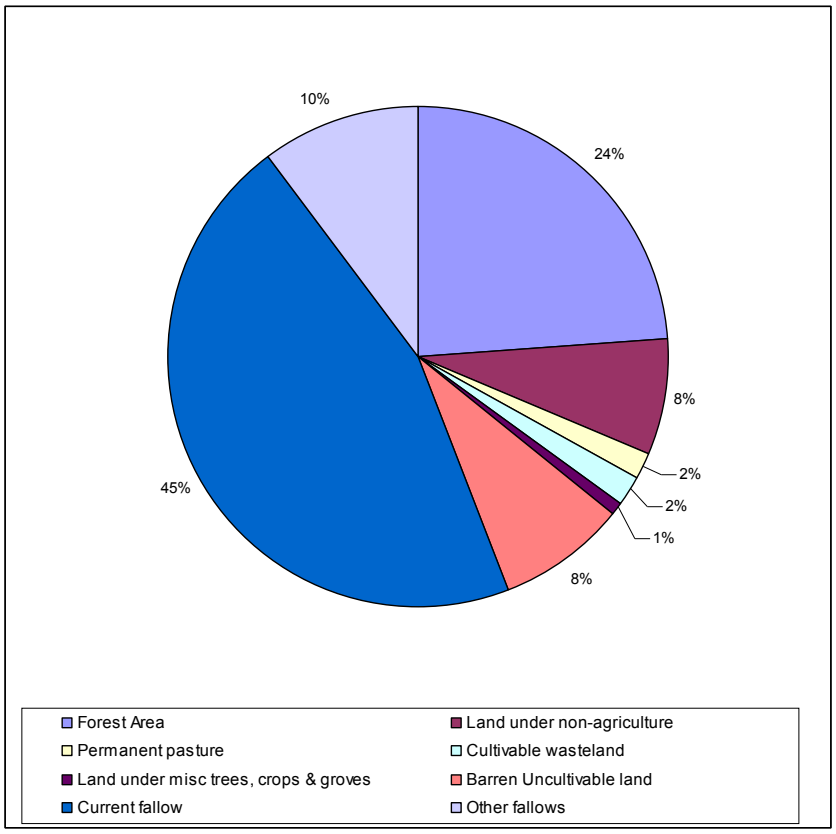
The land use particulars of the district for the year 2012 are given in Table-2 and graphically depicted in Fig :3 .

Table : 2 : Land Utilisation of Mahabubnagar District

(Unit - '000 sq.kmm)

Geographical Area	Forest Area	Land under non-agriculture	Permanent pasture	Cultivable wasteland	Land under misc trees, crops & groves	Barren Uncultivable land	Current fallow	Other fallows
1840.0	255.6	81.1	18.5	19.86	6.8	88.5	488.7	110.8

Fig : 3: Land use Pattern



Irrigation

The total net area irrigated by the different sources in 2010-12 stood at 2,56,238ha, out of which the area irrigated by the ground water resources was 2,13,262ha, which constitutes 83.2% to net area irrigated. Area irrigated by surface water is 34,014 ha, which accounts for 13.7% to the total irrigated area and remaining by other sources. The figures show that the groundwater plays a predominant role in the irrigation.. The irrigation through various sources is given in Table -3.

Table – 3 : Irrigation through various sources

Net Area Irrigated by (Ham)						Gross Area Irrigated (Ham)
Tanks	Canals	Tubewells	Dug wells	Other Sources	Total	
3346	31058	209093	4169	8572	256238	3,30,217

Cropping pattern (2011-2012)

The cropping pattern is always practiced with respect to climatic conditions, availability of irrigation sources and soil types. Paddy has been a stable crop since ages in the agrarian district that is mostly grows under canals, tanks and other wells. Other principal crops like jowar, bajra and grams are mostly rainfed crops. The commercial crops like chillies, cotton and groundnut are grown under irrigation. The total area, under food crops is 478000ha., and not food crops is 355000 ha., which is constitutes 57.38% and 42.61% to the total cropped are respectively. The total cropped area which stands at 833000 ha., shares 45% to the total geographical area of the district.

The major crops grown in the district are paddy, millets, pulses, oilseeds and others. The net area occupied by paddy-13.4%, millets-23.85%, pulses-16.5%, oilseeds-38.7% and others 7.6%.

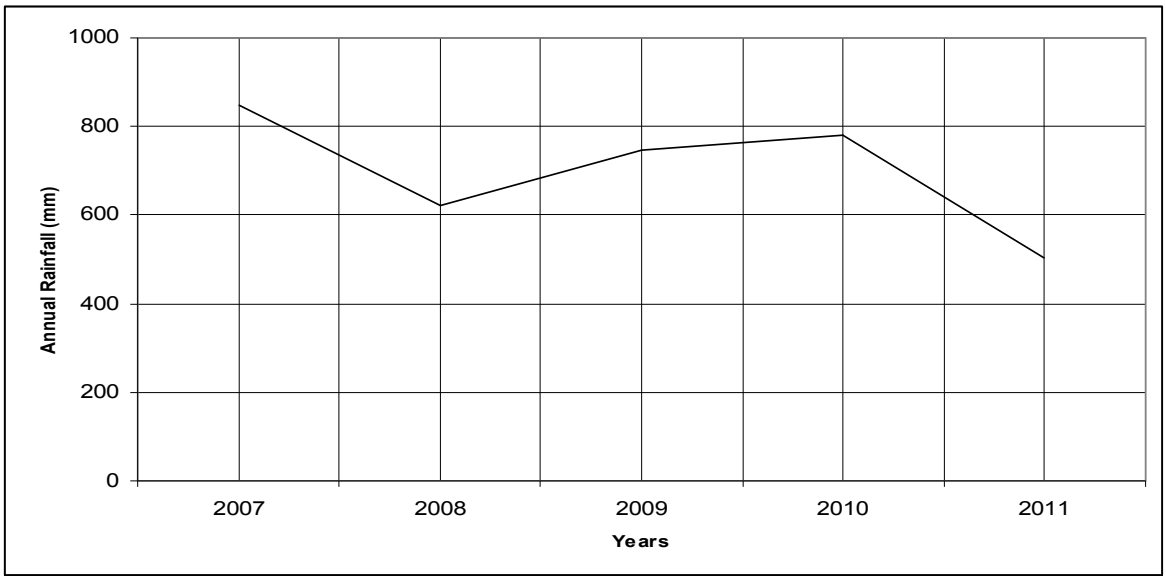
2.0 RAINFALL

The annual rainfall of the district is 633 mm during 2012. The annual rainfall of 2011 is the lowest recorded when compared to last six years. The monthly rainfall for last five years (2007 to 2011) has been presented in Table-4 and depicted graphically in Fig – 4 and given in Table -4.

Table – 4 Monthly rainfall for last five years (2007 to 2011)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Total
2007	0.0	0.0	0.0	2.7	19	230.2	104.1	163.3	252.6	42.6	32.9	0.1	847.5
2008	0.0	7.0	124.5	14.9	8.5	49.9	76.8	185.7	109.0	26.2	19.0	0.4	621.9
2009	0.0	0.0	7.1	4.2	23.2	59.8	41.6	142.8	211.9	229.3	25.6	0.2	745.7
2010	2.9	0.0	0.0	27.4	26.7	54.0	271.1	186.7	133.7	45.9	25	7.9	781.3
2011	0.0	0.5	0.1	37.4	37.3	49.3	150.6	167.7	25.3	36.2	0.0	0.0	504.4

Fig : 4: Monthly rainfall for last five years (2007 to 2011)



3.0 GROUND WATER SCENARIO

HYDROGEOLOGY

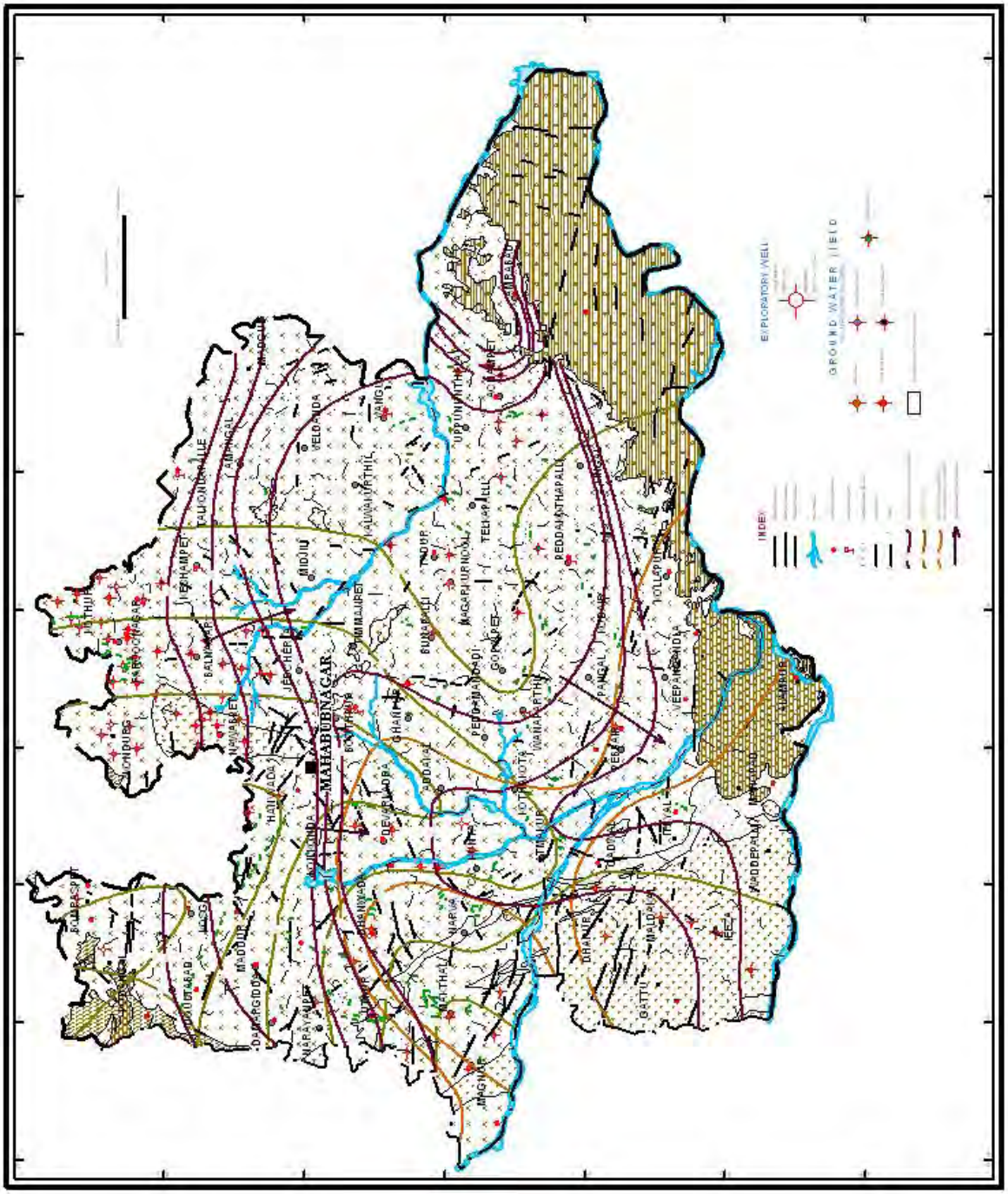
Ground water occurs in all the geological formations in the district. The major rock types in the district are peninsular gneissic crystallines, limestones,

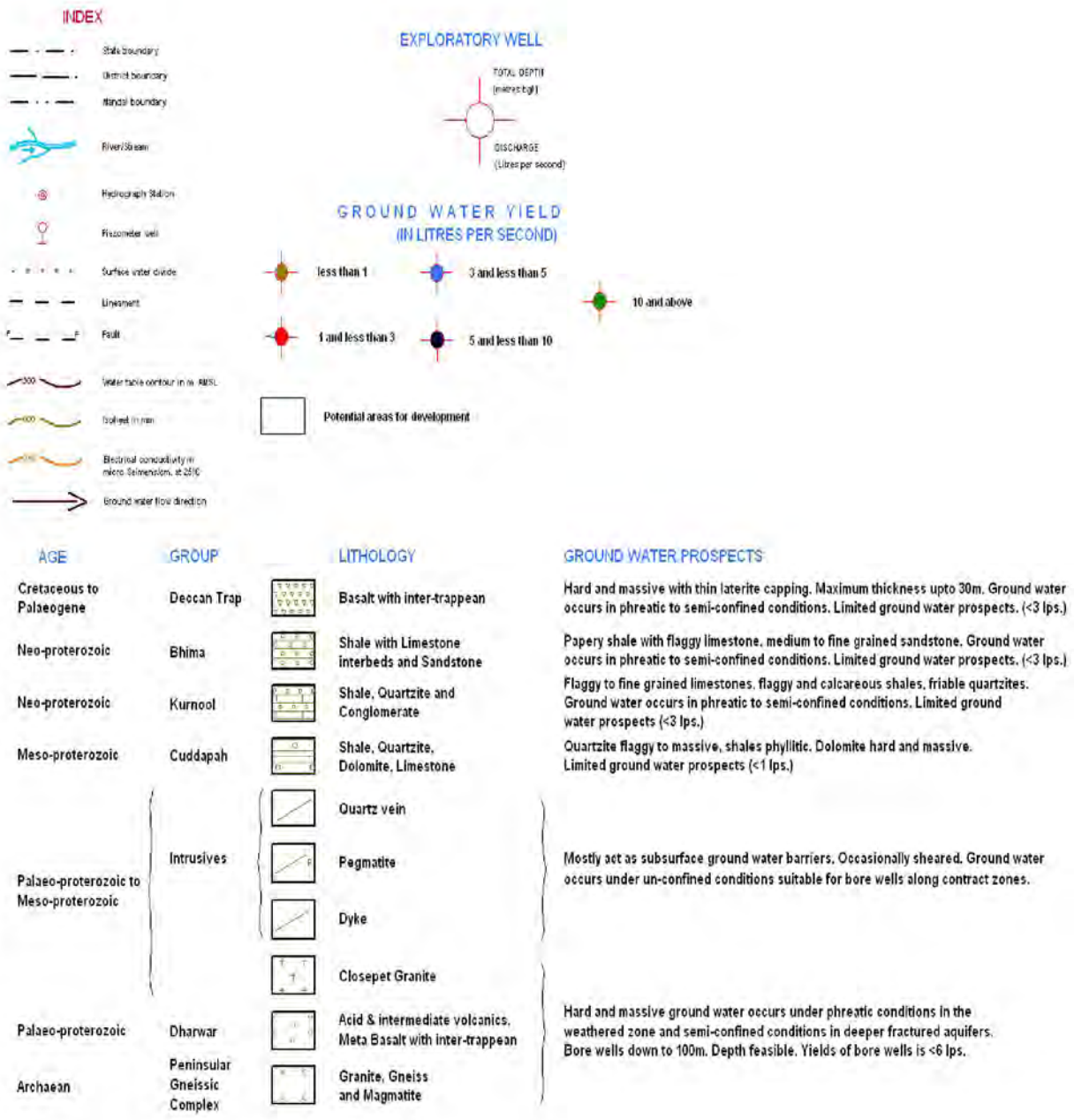
conglomerates, sandstones, shales, basalts and alluvium. The occurrence and behaviour of ground water is an outcome of combined interplay of hydrological, geological, structural, climatological factors, which together form dynamic integrated system. All these factors are inter-dependent and inter-related, each adding its contribution in functioning of the dynamic system. The yield of wells depend on recharge conditions, draft etc. In drought condition, the yield of wells will drastically dwindle in phreatic aquifers. The general hydrogeological conditions in the district presented in Fig.5. The nature and occurrence of the ground water in different water bearing formations are discussed below

Archaean Formations

The Archaean crystalline rocks are represented by pink and grey granites and gneisses. The occurrence of ground water is controlled by the depth and degree of weathering and fracturing. The thickness of weathering of these rocks ranges from 10 to 30 m. Ground water occurs under water table conditions in weathered mantle and semi-confined to confined conditions in the fractured and jointed rocks. The depth of dug wells in weathered zone, Archaean rocks varies from 6 to 20 m with 2 to 3m column of water retained during summer months. The yields of the wells range between 250 and 350 cu.m/day. Storage coefficient varies from 0.002 to 0.020 and specific capacity range from 0.17 to 0.165 lpm/m/dd.

Fig : 5: Hydrogeology – Mahabubnagar District, A.P





The deeper aquifers are developed by constructing bore wells generally down to depth of 100 m. However, generally major aquifer zones are encountered between the depth of 40 to 80 m. Beyond the depth of 80 m, potential zones are rare except along lineament and valleys.

The discharge of the successful bore wells ranges from 0.5 to 6 lps. The transmissivity of aquifer ranges from 4.50 to 150 sq.m/day. The general range is between 20 and 50 sq.m/day.

Ground water in Cuddapah, Kurnool formations

The formations are represented by quartzites, shales, sandstones and limestones and occur in southern part of the district around Srisailam, Kokapur and Alampur. Shales are less permeable. Sandstones and limestones yield copious amount of water. The depth of shallow aquifers of irrigation wells ranges from 5 to 28 mt with yield range between 170 cu.m/day to 250 cu.m/day in post monsoon. The bore wells in Cuddapah have a depth of 45 to 60 mt with a discharge of 3-5 lps.

Deccan Traps

The Deccan trap formations are represented by vesicular-amygdoloidal and massive basalt. These formations are not favourble for shallow aquifers. However, contact zones with the underlying lime stones, shales and granites are favourable for deep bore wells.

Alluvium

The alluvium consists of fine to coarse sand and clay and is occasionally admixed with gravel. It occurs along the bank of Dindi river in a limited extent. Hence, the thickness of alluvium ranges from 2.5 m to 9 m bgl. The yields vary from 105 to 200 cu.m/day.

Shallow aquifer system:

The Central Groundwater Board has constructed about 8 peizometers down to the depth of 30m. and 129 deep exploratory wells down to the depth of 200m in various hydrogeological condtions in the district. Thickness of the weathered mantle of these

Crystalline rocks ranges from 1 to 25 m depth. The aquifers in pink granite are more potential than those in grey granites. Majority of the aquifer zones encountered within the depth range of 15 to 25 meters below ground level (m bgl). The aquifer zones are under unconfined conditions. For irrigation purpose, the shallow aquifer system is generally tapped by the dug wells down to the depth of 12 to 20m and dug-cum-bore wells down to the depth of 40 m. The yields of dug wells ranges between 180 and 250 m3/day. The transmissivity values range from 15 to 50 m^2/day. The discharges of the shallow bore wells range from 3 to 4 lps The transmissivity values range from 20 to 40 m2/day.

Deep aquifer systems:

In order to study the deep aquifer system, CGWB has drilled about 129 deep exploratory boreholes down to the depth of 200 m in various hydrogeological conditions. The deep exploratory drilling revealed that the fractures are of vertical to sub-vertical and also of horizontal in their disposition. It has been observed that about 80% of major aquifer zones are encountered between the range of 25 and 70 m and 15% of fracture zones are encountered in a depth range of 70 to 150 m depth. Beyond the depth of 150m, aquifers are very rare except alone major lineaments and deep valleys. Discharge of the successful wells ranges between 3 and 5 liters per second. The transmissivity values range from 20 to 50 sq.m./day. Specific capacity ranges from 15 to 30 lpm/m/dd. The storage coefficient values range between 3.0x10 to $5.0x10^{-6}$. In the district, generally, the farmers construct deep irrigation bore wells down to the depth of 80 m.

4.0 DEPTH TO WATER LEVEL

Ground water level scenario in the district is monitored four times in a year from a network of 35 of observation and piezometer wells.

Pre-monsoon

The pre-monsoon water level map for the year 2012 (Fig.6) shows that, the depth to water level ranges from 3 to 20m. The shallow water level of <5 m is found in Maganoor mandal and part of Madkal, Itikyal and Gadwal mandals. The water level

range of 5-10 m is found in western fringe of the district. The water level, between 10-20 m bgl are observed along the western boundaries and eastern fringe of the district. The deeper water level beyond 20m is observed in the eastern most part covering the mandals of Keshampet, Talkondapalli and Balnagar in the district. The minimum and maximum depth to water levels are 3.89 m bgl (Goka paslabad) and 24.50 m bgl (Bommarajupalli).

Post-monsoon

Analysis of the water level data of post-monsoon, 2012 (Fig.7) shows that the area under <2 m bgl are found as isolated patches in northern and southern parts of the district. The water level between 2 and 5 m bgl is found in about 40% of the area in the northern, eastern and southern parts of the district. Water level above 5 m bgl is found in about 60% of the area.

Water level fluctuation

Fluctuations in the water level between pre and post-monsoon period of 2012 are reflected by the rise all over the district. (Fig.8). The rise of water level of >4 m is witnessed in the entire district, leaving small pockets, where water level rise is between 2-4 m. Less than 2 m rise is observed in 30%.

Fig : 6: Depth to Water Level – Pre-monsoon (May 2012)

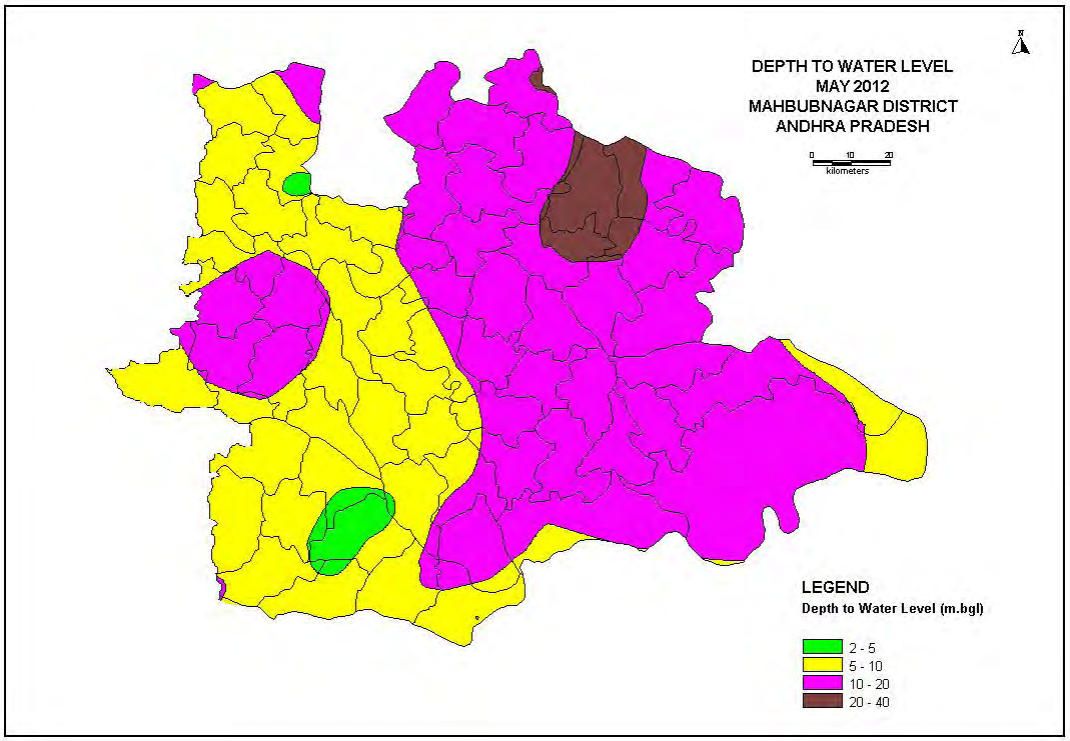


Fig : 7: Depth to Water Level – Post monsoon (Nov-2012)

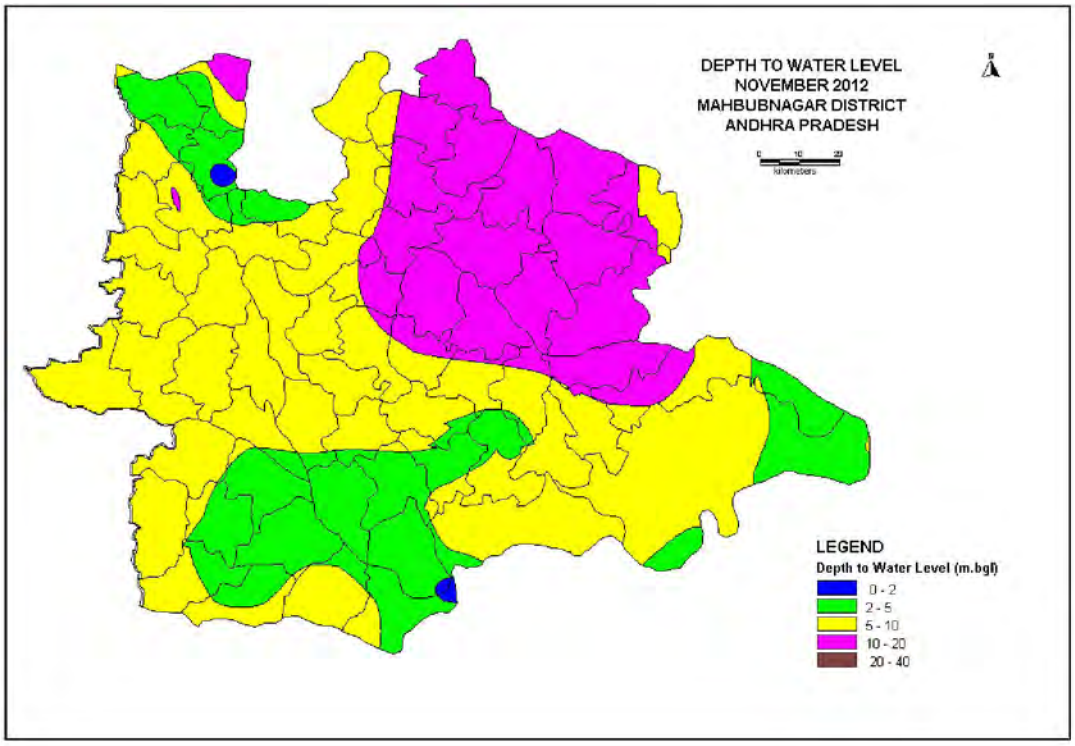
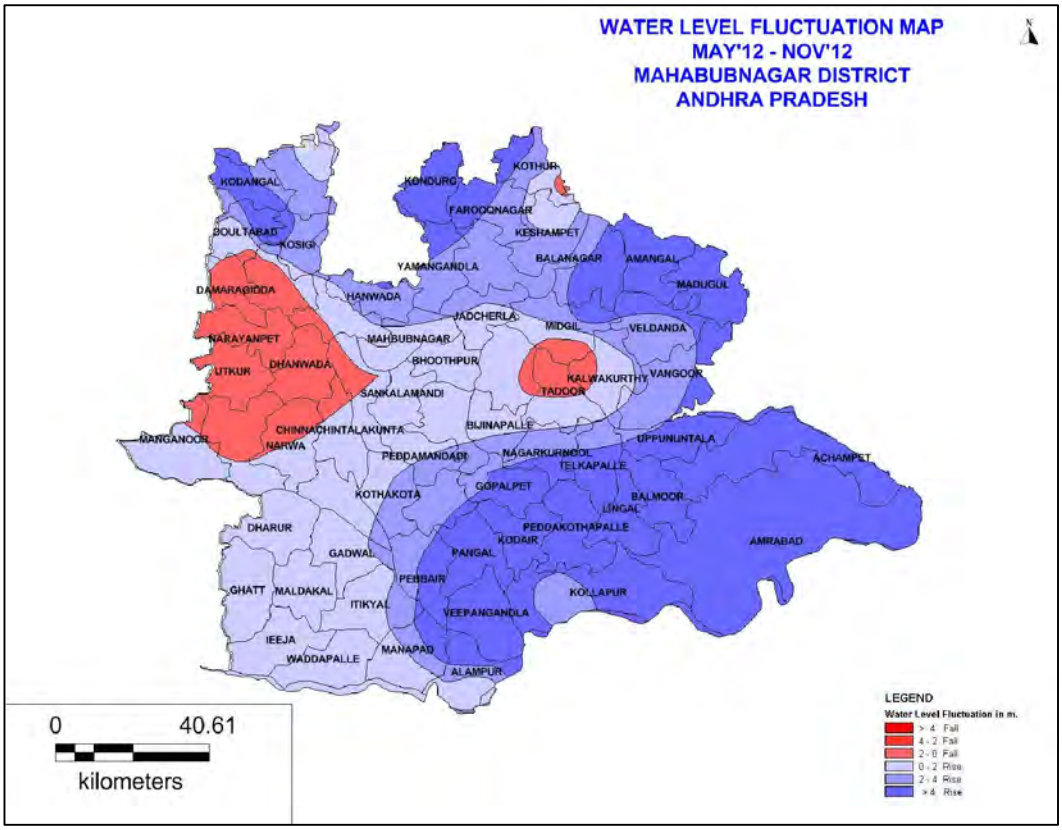


Fig : 8: Water Level Fluctuation (Pre- Post Monsoon – 2012)



Long term water levels

An analysis of water level data, collected by C.G.W.B shows annual 'fall' is in 27 wells, constituting 39% of the wells, with range from 0.0125 (Amrabad) to 0.41m/yr (monsoon). During post monsoon period, fall is observed in 35% of the wells ranging from 0.1 m to 0.72 m/yr (Kothakonda). It is observed that 28% wells show rising trend and 72% of wells show declining trend out of 68 observation wells.

5.0 GROUND WATER RESOURCES

Based on the ground water estimation committee (GEC-2008-2009) norms ground water assessment was done in 2009. Available ground water resource in the district is **390.78 MCM in command area and 1039.44 MCM** in non-command area of the district. Ground water utilization is 131.62 MCM and 885.77 MCM in command and non-command areas, respectively. The ground water balance is **259.16 MCM and 544.45** MCM in command and non-command areas, respectively. Based on the stage of ground water development and the water level trends, the mandal and ground water units have been classified into four categories. Over all, the district falls under safe category with the average stage of development stands at 62%. The stage of development in non-command area is 73% suggesting that the non-command area is on the verge of semi-critical category. Mandal-wise Assessment Of Wise Dynamic Groundwater Resources of Mahabubnagar District, Andhra Pradesh [2008-2009] [In Ha.M.] is given in Table-5. The mandal-wise categorization in respect to ground water development as per GW Resources estimation 2008-09 is presented as Fig.8.

Fig – 8: Mandal-wise Categorisation in Mahabubnagar District (GEC 2008-09)

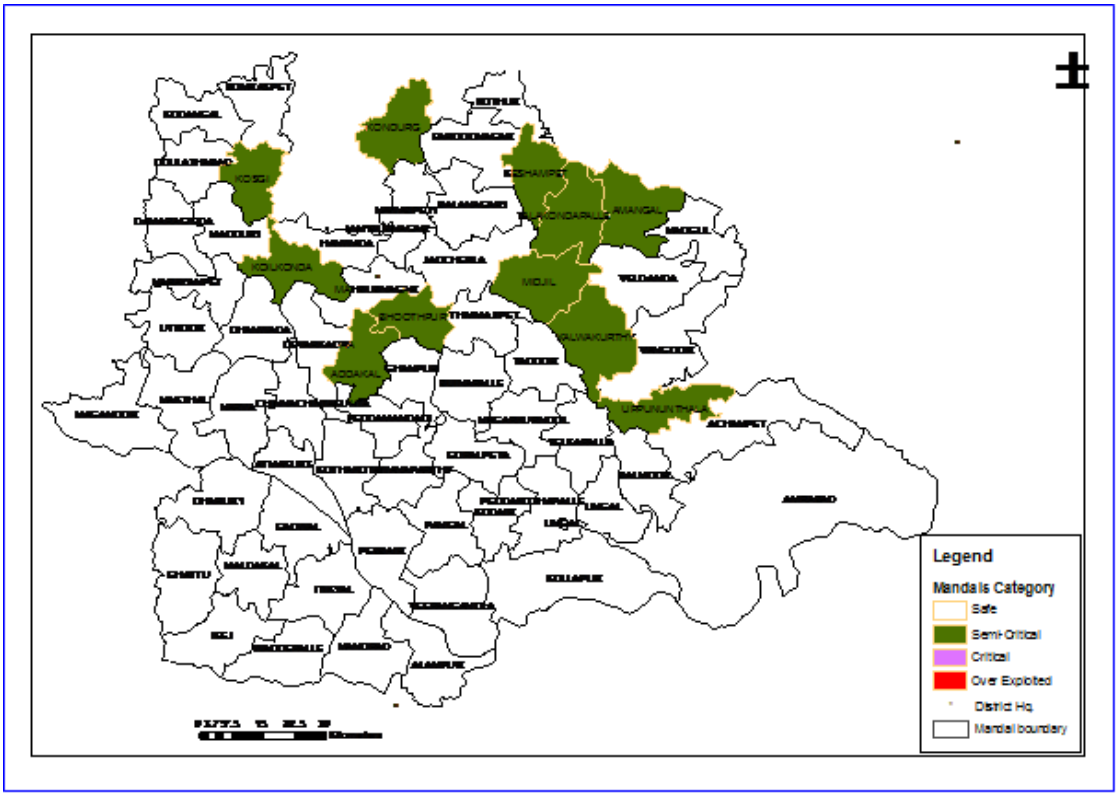


Table – 5 : Mandal-wise Assessment Of Wise Dynamic Groundwater Resources Of The Mahabubnagar District, Andhra Pradesh [2008-2009] [In Ha.M.]

Sl.No	Mandal	C/ NC/ T	Recharge from rainfall during monsoon season	Recharge from other sources during monsoon season	Recharge from rainfall during non-monsoon season	Recharge from other sources during non-monsoon season	Total annual ground water recharge [4+5+6+7]	Provision for natural discharge	Net annual ground water availa-bility
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	Achampeta	C	0	0	0	0	0	0	0
		NC	2252	206	720	308	3486	349	3137
		T	2252	206	720	308	3486	349	3137
2	Addakal	C	0	0	0	0	0	0	0
		NC	895	172	293	245	1605	160	1445
		T	895	172	293	245	1605	160	1445
3	Alampur	C	697	954	328	1067	3046	305	2741
		NC	303	20	112	27	462	24	438
		T	1000	974	440	1094	3508	329	3179
4	Amangal	C	0	0	0	0	0	0	0
		NC	732	134	343	189	1398	140	1258
		T	732	134	343	189	1398	140	1258
5	Amrabad	C	0	0	0	0	0	0	0
		NC	7311	173	2967	256	10707	1070	9637
		T	7311	173	2967	256	10707	1070	9637
6	Atmakur	C	456	655	194	607	1912	191	1721
		NC	259	71	108	95	533	53	480
		T	715	726	302	702	2445	244	2201
7	Balanagar	C	0	0	0	0	0	0	0
		NC	1811	276	501	443	3031	303	2728
		T	1811	276	501	443	3031	303	2728
8	Balmoor	C	0	0	0	0	0	0	0
		NC	1256	275	489	347	2367	237	2130
		T	1256	275	489	347	2367	237	2130
9	Bhoothpur	C	0	0	0	0	0	0	0
		NC	766	160	258	230	1414	141	1273
		T	766	160	258	230	1414	141	1273
10	Bijinapalle	C	0	0	0	0	0	0	0
		NC	990	223	458	301	1972	116	1856
		T	990	223	458	301	1972	116	1856
11	Bomraspeta	C	0	0	0	0	0	0	0
		NC	1386	223	317	327	2253	225	2028
		T	1386	223	317	327	2253	225	2028
12	Chinna Chinta Kunta	C	0	0	0	0	0	0	0
		NC	659	157	281	215	1312	107	1205
		T	659	157	281	215	1312	107	1205
13	Damaragidda	C	0	0	0	0	0	0	0
		NC	947	168	316	232	1663	86	1577
		T	947	168	316	232	1663	86	1577
14	Devarkadara	C	0	0	0	0	0	0	0
		NC	1216	199	382	280	2077	208	1869
		T	1216	199	382	280	2077	208	1869
15	Dhanwada	C	0	0	0	0	0	0	0
		NC	962	186	388	261	1797	90	1707
		T	962	186	388	261	1797	90	1707

1	2	3	4	5	6	7	8	9	10
16	Dharur	C	123	135	63	113	434	43	391
		NC	1285	152	422	188	2047	205	1842
		T	1408	287	485	301	2481	248	2233
17	Doulatabad	C	0	0	0	0	0	0	0
		NC	1220	214	302	258	1994	185	1809
		T	1220	214	302	258	1994	185	1809
18	Gadwal	C	678	1067	318	821	2884	288	2596
		NC	389	35	135	46	605	57	548
		T	1067	1102	453	867	3489	345	3144
19	Ghanpur	C	0	0	0	0	0	0	0
		NC	703	228	305	323	1559	156	1403
		T	703	228	305	323	1559	156	1403
20	Ghattu	C	0	0	0	0	0	0	0
		NC	1213	209	516	302	2240	224	2016
		T	1213	209	516	302	2240	224	2016
21	Gopalpeta	C	0	0	0	0	0	0	0
		NC	958	193	422	258	1831	177	1654
		T	958	193	422	258	1831	177	1654
22	Hanwada	C	0	0	0	0	0	0	0
		NC	938	198	258	294	1688	111	1577
		T	938	198	258	294	1688	111	1577
23	Ieeza	C	0	0	0	0	0	0	0
		NC	876	167	412	262	1717	172	1545
		T	876	167	412	262	1717	172	1545
24	Itikyal	C	592	916	276	787	2571	257	2314
		NC	540	52	218	88	898	74	824
		T	1132	968	494	875	3469	331	3138
25	Jadcherla	C	0	0	0	0	0	0	0
		NC	1404	212	393	316	2325	232	2093
		T	1404	212	393	316	2325	232	2093
26	Kalwakurthy	C	0	0	0	0	0	0	0
		NC	1343	261	502	417	2523	252	2271
		T	1343	261	502	417	2523	252	2271
27	Keshampeta	C	0	0	0	0	0	0	0
		NC	1330	223	403	427	2383	238	2145
		T	1330	223	403	427	2383	238	2145
28	Kodair	C	0	0	0	0	0	0	0
		NC	791	167	347	211	1516	152	1364
		T	791	167	347	211	1516	152	1364
29	Kodangal	C	0	0	0	0	0	0	0
		NC	1561	164	357	200	2282	228	2054
		T	1561	164	357	200	2282	228	2054
30	Koilkonda	C	0	0	0	0	0	0	0
		NC	1130	265	381	376	2152	182	1970
		T	1130	265	381	376	2152	182	1970
31	Kollapur	C	0	0	0	0	0	0	0
		NC	1783	189	786	219	2977	298	2679
		T	1783	189	786	219	2977	298	2679
32	Kondurg	C	0	0	0	0	0	0	0
		NC	1459	206	393	303	2361	236	2125
		T	1459	206	393	303	2361	236	2125
33	Kosgi	C	0	0	0	0	0	0	0
		NC	991	174	244	209	1618	152	1466
		T	991	174	244	209	1618	152	1466
34	Kothakota	C	198	1699	88	531	2516	252	2264
		NC	823	149	343	226	1541	154	1387
		T	1021	1848	431	757	4057	406	3651

1	2	3	4	5	6	7	8	9	10
35	Kothur	C	0	0	0	0	0	0	0
		NC	1192	240	359	331	2122	212	1910
		T	1192	240	359	331	2122	212	1910
36	Lingal	C	0	0	0	0	0	0	0
		NC	1259	144	386	200	1989	199	1790
		T	1259	144	386	200	1989	199	1790
37	Maddur	C	0	0	0	0	0	0	0
		NC	1016	177	331	242	1766	89	1677
		T	1016	177	331	242	1766	89	1677
38	Madgul	C	0	0	0	0	0	0	0
		NC	935	208	474	278	1895	189	1706
		T	935	208	474	278	1895	189	1706
39	Maganoor	C	0	0	0	0	0	0	0
		NC	1206	216	403	309	2134	213	1921
		T	1206	216	403	309	2134	213	1921
40	Mahbubnagar	C	0	0	0	0	0	0	0
		NC	1358	174	367	255	2154	211	1943
		T	1358	174	367	255	2154	211	1943
41	Makthal	C	103	68	44	78	293	29	264
		NC	1125	251	443	377	2196	220	1976
		T	1228	319	487	455	2489	249	2240
42	Maldakal	C	0	0	0	0	0	0	0
		NC	990	118	393	182	1683	168	1515
		T	990	118	393	182	1683	168	1515
43	Manopadu	C	611	810	287	962	2670	267	2403
		NC	393	35	155	59	642	49	593
		T	1004	845	442	1021	3312	316	2996
44	Midjil	C	0	0	0	0	0	0	0
		NC	1641	332	556	513	3042	304	2738
		T	1641	332	556	513	3042	304	2738
45	Nagar Kurnool	C	0	0	0	0	0	0	0
		NC	947	187	422	246	1802	114	1688
		T	947	187	422	246	1802	114	1688
46	Narayanpet	C	0	0	0	0	0	0	0
		NC	953	177	355	255	1740	87	1653
		T	953	177	355	255	1740	87	1653
47	Narva	C	157	104	68	120	449	45	404
		NC	798	209	341	323	1671	149	1522
		T	955	313	409	443	2120	194	1926
48	Nawabpet	C	0	0	0	0	0	0	0
		NC	1261	180	332	282	2055	205	1850
		T	1261	180	332	282	2055	205	1850
49	Pangal	C	112	524	41	549	1226	123	1103
		NC	814	197	331	267	1609	161	1448
		T	926	721	372	816	2835	284	2551
50	Pebbair	C	732	4992	298	3729	9751	975	8776
		NC	289	76	118	107	590	59	531
		T	1021	5068	416	3836	10341	1034	9307
51	Peddakothapalle	C	0	0	0	0	0	0	0
		NC	1745	166	705	205	2821	282	2539
		T	1745	166	705	205	2821	282	2539
52	Peddamandadi	C	0	0	0	0	0	0	0
		NC	689	194	301	276	1460	146	1314
		T	689	194	301	276	1460	146	1314
53	Shadnagar	C	0	0	0	0	0	0	0
		NC	1694	243	479	380	2796	280	2516
		T	1694	243	479	380	2796	280	2516

1	2	3	4	5	6	7	8	9	10
54	Tadoor	C	0	0	0	0	0	0	0
		NC	1128	193	370	272	1963	172	1791
		T	1128	193	370	272	1963	172	1791
55	Talakondapalle	C	0	0	0	0	0	0	0
		NC	1575	293	540	470	2878	288	2590
		T	1575	293	540	470	2878	288	2590
56	Telkapalle	C	0	0	0	0	0	0	0
		NC	1111	181	448	237	1977	187	1790
		T	1111	181	448	237	1977	187	1790
57	Thimmajipeta	C	0	0	0	0	0	0	0
		NC	1006	178	310	255	1749	172	1577
		T	1006	178	310	255	1749	172	1577
58	Uppununthala	C	0	0	0	0	0	0	0
		NC	903	179	345	252	1679	168	1511
		T	903	179	345	252	1679	168	1511
59	Utkoor	C	0	0	0	0	0	0	0
		NC	1043	204	404	300	1951	133	1818
		T	1043	204	404	300	1951	133	1818
60	Vangoor	C	0	0	0	0	0	0	0
		NC	1320	201	645	321	2487	249	2238
		T	1320	201	645	321	2487	249	2238
61	Veldanda	C	0	0	0	0	0	0	0
		NC	1423	192	551	294	2460	246	2214
		T	1423	192	551	294	2460	246	2214
62	Waddepalle	C	0	0	0	0	0	0	0
		NC	1030	149	398	253	1830	183	1647
		T	1030	149	398	253	1830	183	1647
63	Wanaparthy	C	0	0	0	0	0	0	0
		NC	701	135	307	201	1344	134	1210
		T	701	135	307	201	1344	134	1210
64	Weepangandla	C	606	2839	224	2978	6647	665	5982
		NC	654	136	280	172	1242	125	1117
		T	1260	2975	504	3150	7889	790	7099
	District	C	**5065**	**14763**	**2229**	**12342**	**34399**	**3440**	**30959**
		NC	**74681**	**11666**	**26921**	**16793**	**130061**	**12188**	**117873**
		T	**79746**	**26429**	**29150**	**29135**	**164460**	**15628**	**148832**

C-Command; NC-Non-command; T-Total.

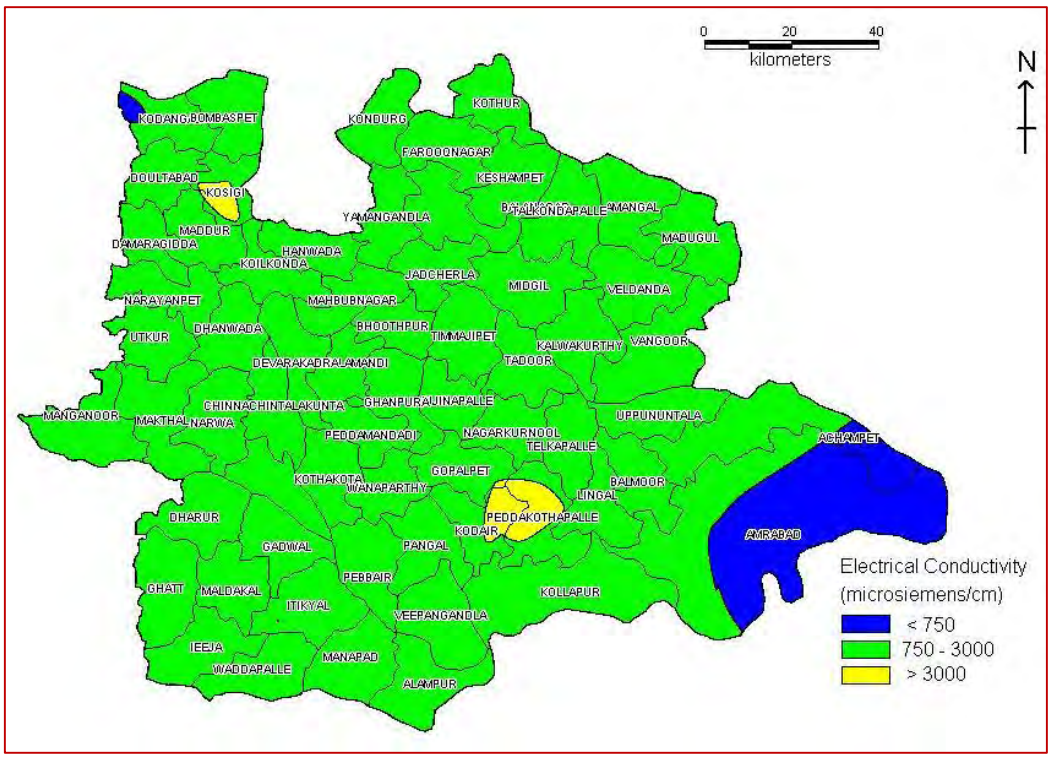
6.0 GROUND WATER QUALITY

Ground water in the district, in general is suitable for both domestic and irrigation purposes. The Electrical Conductivity ranges from 673 to 3000 micro siemens /cm at 25° C. Nitrate is in the range of 11 to 472 mg/l. Fluoride content in ground water range from 0.37 to 2.4 mg/l. The chemical analysis data of Mahabubnagar district for the year 2011 is given in Table - 6. The distribution of electrical conductivity is shown as Fig - 9

Table – 6: Details of Chemical Analysis (May 2011) (Dug wells)

Location	Source	pH	Electrical cond. µS /cm at 25°C	Chemical constituents in mg / l										
				Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_4	F	SAR
Ravalpalle	DW	7.1	673	56	39	11	0.39	0	189	60	16	88	0.63	0.3
Gundimal	DW	6.7	3100	200	127	230	17.2	0	384	525	110	458	0.64	3.1
Devarakhadra	DW	7.5	1200	34	28	179	0.39	0	573	85	4.3	15	1.10	5.5
Vattivelipalli	DW	7.7	597	50	9.79	37	35	0	177	53	2.2	62	0.61	1.3
Gadwal	DW	7.2	2240	352	0.43	115	4.7	0	244	383	218	208	0.41	1.7
Kollapur	DW	7.4	2240	128	82.8	258	4.3	0	299	567	140	38	0.75	4.4
Alampur1	DW	7.3	2417	192	39.1	340	7.8	0	250	503	417	44	1.30	5.9
Velgonda	DW	8.1	2711	184	48.9	380	117	0	854	553	113	5	0.70	6.4
Peddakottapalle	DW	7.4	3240	224	63.5	179	0.78	0	250	553	125	114	0.37	2.7
Ragidimailaram	DW	7.9	2416	192	44	212	78	0	390	369	122	284	0.69	3.6
Bongkur	DW	7.6	2419	120	68.2	313	7	0	451	355	290	120	1.50	5.7
Metlakunta	DW	7.7	2493	46	30.5	110	1.2	0	354	85	22	51	2.40	3.1
Y.chowrasta	DW	7.1	2953	264	83	239	2	0	244	496	208	504	0.28	3.3
Bandrapal	DW	7.3	3000	128	48.8	472	2.3	0	488	553	252	125	0.73	9.0

Fig – 9: Distribution of Electrical Conductivity in Mahabubnagar District (2011)



7.0 STATUS OF GROUND WATER DEVELOPMENT

In command area, the ground water development is carried out through dug wells, piercing through the weathered mantle, to tap water table zone, with the depth ranging from 10 to 15 m below ground level and through bore wells ranging in depth from 60 to 80 m to harness the fractured and jointed aquifers. The yield of dug wells varies between 170 and 215 cu.m/day and would sustain 3-4 hrs of pumping for two spells in a day. The discharge of bore wells ranges from 1.5 to 2.0 ltrs./second, sustaining 3 to 5 hrs. of pumping by 3 HP motor with draw down of 10 to 15 m.

In non-command area, the ground water is developed through dug wells with depth of 6-9 m bgl and with shallow bore wells ranging from 25 to 40 m below ground level. The yield of the dug wells varies from 170 to 250 cu.m/day and the well would sustain for 4 to 6 hrs. in a day. The discharge of the bore well ranges from 3 to 5 lps.

8.0. RECOMMENDATIONS

1. In non-command area, where further development of groundwater is possible the sites should be selected on scientific basis.
2. In non-command area, ground water resources are scarce, therefore, less water intensive crops be raised and alternative irrigation methods like drip and sprinkler irrigation may be encouraged and farmers may be given loans with enhanced subsidy. Technical guidance has to be provided to the illiterate farmers in maintaining these irrigation equipment.
3. To stop surface run off and to enhance ground water storage, ground water conservation and artificial recharge structures must be taken up, on suitable locations.
4. Watershed management plans with people's participation must be adopted and impact assessment studies should be carried out on scientific basis.
5. Peoples Participatory Programme along mass awareness programmes must be conducted widely on regular basis in the rural areas to educate the farmers regarding the water management and to update their knowledge.

6. Training for local government functionaries, NGOs, voluntary organizations engaged in watershed development activity to be given in scientific selection of sites, design of structures, for construction of rainwater harvesting and artificial recharge structures.
7. There should be a complete institutional credit cover to the small and marginal farmers for drilling deep bore wells in ground water potential areas, for procuring water saving equipment like drip and sprinkler systems, etc. Insurance facility should be provided to cover the health of farmers and their families, damaged crops due to severe drought conditions, unforeseen loss, market rates for the agriculture produce, etc.
8. To minimize the dependence solely on agriculture, the government should provide loan facility with enhanced subsidy to the farmers to initiate dairy and poultry farm for supplementary income.
9. In order to impart education to the farmers, regarding cropping pattern, hybrid varieties, pesticides, irrigation techniques etc., 'Agri-clinics' may be established in rural areas for every five villages in non-command areas.
10. The spacing norms between two adjacent bore wells, as per the norms of APWALTA act, should be strictly implemented.

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