# CENTRAL GROUND WATER BOARD
## MINISTRY OF WATER RESOURCES
## GOVERNMENT OF INDIA

# GROUND WATER INFORMATION
# NALGONDA DISTRICT, ANDHRA PRADESH

SOUTHERN REGION
HYDERABAD
JULY, 2007

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# NALGONDA DISTRICT, ANDHRA PRADESH


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# GROUND WATER INFORMATION
# NALGONDA DISTRICT, ANDHRA PRADESH

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**CONTENTS**

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## GROUND WATER INFORMATION
## NALGONDA DISTRICT, ANDHRA PRADESH


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# DISTRICT AT A GLANCE

## 1. GENERAL

| | | | |
|---|---|---|---|
| Location | North Latitude | 16° 25′ | 17° 50′ |
| | East Longitude | 78° 40′ | 80° 05′ |
| Headquarters | | Nalgonda | |
| No. of revenue mandals | | 59 | |
| No. of revenue villages | | 1186 | |
| Population (2001) | Urban | 432678 | |
| | Rural | 2815304 | |
| Total | | 3247982 | |
| Population density | | 227 | |
| Work force | | 1594666 | |
| | Cultivators | 406502 | |
| | Agricultural labour | 671241 | |
| Major rivers | | Musi and Dindi | |
| Geology | | Granites, gneisses, limestones and alluvium | |
| Soils | | Red loamy soil | |
| Agroclimatic zone | | Southern Telangana and Krishna Godavari zone | |

## 2. RAINFALL

| | | |
|---|---|---|
| Normal annual rainfall | Total | 753 mm |
| | Southwest monsoon | 70% |
| | Northeast monsoon | 18% |
| Cumulative departure from normal rainfall for the last 5 years | | -90% |

**3. LAND USE (2005-'06) (in ha.)**

| | |
|---|---|
| Forest | 86000 |
| Barren and uncultivated | 90000 |
| Cultivable waste | 28000 |
| Current fallows | 305000 |
| Net area sown | 538000 |

**4. IRRIGATION (2005-'06) (Area in ha.)**

| | |
|---|---|
| Source of irrigation | |
| Canals | 75000 |
| Tanks | 19000 |
| Dug wells | 46000 |
| Bore / Tube wells | 93000 |
| Others | 10000 |
| Net area irrigated | 243000 |
| Gross area irrigated | 374000 |
| Major irrigation projects | Nagarjunasagar |
| Medium irrigation proejcts | Musi, Dindi |
| | Utkoor Asifnagar |

**5. GEOLOGY**

| | |
|---|---|
| Major rock types | Granites, |
| | gneisses, |
| | Limestones, alluvium |

**6. GROUND WATER**

| | | |
|---|---|---|
| Well census (2005-'06) | | |
| Dug wells | | 109,380 |
| Shallow tube / bore wells | | 55556 |
| Deep tube / bore wells | | 62 |
| Exploration by CGWB | | |
| No. of wells drilled | | EW-98, WT-40 |
| Major aquifer zones | | 35.0-80.0 m |
| Aquifer parametres | | |
| Transmissivity (sq.m/day) | Hard rock | 25 to 120 |
| | Soft rock | 470 |
| Storage Co-efficient | Hard rock | 1.6 x 10 -4 to |

| | | |
|---|---|---|
| | | $3.5 \times 10^{-4}$ |
| | Soft rock | |
| Monitoring | | |
| No. of observation wells | | |
| Dug wells | | 15 |
| Piezometers | Manual | 35 |
| | | (8 DWLRs + 27 manual |
| | | Digital recording |
| Range of water levels (May 2005) | | |
| Minimum (m below ground level) | | 1.4 |
| Maximum ( m bgl) | | 20.43 |
| General range ( m bgl) | | 10 to 16 |

**7. GROUND WATER RESOURCES (MCM)**

| | |
|---|---|
| Net annual ground water availability | 1870.08 |
| Net annual draft | 976.2 |
| Balance resource | 937 |
| Stage of ground water development | 52% |

**8. GROUND WATER DEVELOPMENT CATEGORY**

| | |
|---|---|
| No. of mandals categorised as | |
| Safe (<70 % of net available resource) | 27 |
| Semi Critical (70 - 90 %) | 25 |
| Critical (90 - 100 %) | 4 |
| Over exploited (> 100 %) | 3 |
| No. of villages notified for restricted development | 367 |
| (by State Ground Water Authority) | |

**9. CHEMICAL QUALITY**

| | | |
|---|---|---|
| Electrical Conductivity (micro Siemens / cm at 25 deg. C) | | 1000-2500 |
| Chloride | (mg/l) | 150-500 |
| Fluoride | (mg/l) | 0.5-4.25 |
| Nitrate | (mg/l) | 30.0-200.0 |

# GROUND WATER INFORMATION
# NALGONDA DISTRICT, ANDHRA PRADESH

## 1.0 INTRODUCTION

### 1.1 General:

Nalgonda district is one of the 23 districts of Andhra Pradesh, with a total geographical area of 14,322.4 sq.km. with 59 mandals and four Revenue Divisions inhabitating the population of 3247982(2001-census) spreading across 1186 revenue villages, with 87% of population lives in rural areas, and are mainly dependent on agriculture and other occupations.

The district lies between North latitudes 16 25' and 17 50' and between East longitudes 78 40' and 80 05' forms a part of major basin of Krishna river and is covered by Survey of India toposheet Nos. 56K, 56L, 56O and 56 P. The district with headquarters at Nalgonda town is well connected with road, railway and telecommunications. Two railway lines, Secunderabad-Vijayawada and Secunderabad-Guntur pass through the district (**Fig.1**.).

No major industries in the district , but small scale industries are operating at Ravoor,Dondapad and Vishnupuram. The district is endowed with minerals like limestone, clay, building materials and recently big Uranium deposits have been discovered in P.A. Pally mandal area. As for the agriculture is concerned, the main source of irrigation is groundwater being 65.90% of total gross area irrigated, where as surface water irrigation accounts for 34.09% of gross area.

There are seven surface irrigation projects in the district viz; Nagarjunasagar, Musi, Dindi, Asifnagar, Pendlipalkala, Shaligowraram and Bheemanpally projects. Tthere are 4404 tanks including 421 large Tanks. With regard to groundwater abstraction structures are concerned, about 55556 bore wells and about 109380 dug wells exist in the district. Paddy is the staple food crop, which is mostly cultivated under canals, tanks and wells. The other


FIG. - 1
INDEX MAP
NALGONDA DISTRICT
ANDHRA PRADESH
NALGONDA
RIVER / STREAM
RESERVOIR
IRRIGATION CANAL
OBSERVATION WELL
PIEZOMETER
MANDAL BOUNDARY
DISTRICT BOUNDARY
MANDAL HEADQUARTER
DISTRICT HEADQUARTER
HILLS

principal crops are Jowar,Bajra,maiz,chillies groundnut and cotton also grown as well.

The soils occurring in the district are, black cotton, alkaline and alluvial soils , of which red soils constitute 85% of the area. Black soil is found over the lime stone area, in the southeastern part of the district.

**1.2 Distress situation**

Owing to the prevalence of drought conditions in Nalgonda district for long period, distress among the farmers have been on the rise for the last two years. As per the official sources, since May, 2004, as many as 200 farmers committed suicides in the District. Most of the farmers belong to marginal category and non-command area, who grow rain fed crops are resorting to suicides. The main cause of the distress situation among farmers is due to following factors

1. The farmers of small land holdings go on sinking 'spree' of dry bore holes, in thinking the hope of successful bore well by borrowing loans from private lending agencies at exorbitant interest rates. As a result, the farmers are unable to repay the piled up loans and committing suicides.
2. Cost of inputs and overall investment on crop is higher than the supporting price for procurement of grains is pushing the farmers into distress situation.
3. Because of high fluctuations in the market, farmers are not getting profitable prices for their commercial produce. As such, being pushed into indebtedness.
4. Lack of awareness regarding ground water management techniques and cropping pattern resulting in crop failures, pushing the farmers into stress.
5. Because of the frequent and long power interruptions, the farmers are unable to irrigate the crop to optimum level, resulting in crop failures and low yields.

## 1.3 Drainage

The whole of Nalgonda district is drained by the river Krishna along with tributaries Musi, Aler, Dindi, Halia and Peddavagu rivers, which are tributaries of Krishna river. The major Krishna river forms the southern boundary of the district. The Krishna river enters the south western part of the district and flows along the southern boundary for a distance of about 85 kms. The Musi river is the main tributary of river Krishna. The Paler river drains eastern part of the district. The directions of all the three river coarses are controlled by two major lineaments in east-west and northwest southeast directions. All other lower order streams and nallas are controlled by minor lineaments. The district divided into 64 micro-basins.

The major river Krishna is perennial and all other rivers are seasonal and ephemeral. The overall drainage pattern in the districts is dendritic to sub - dendritic and rectangular.

## 1.4 Land Use:

The land use particulars of the district for the year 2005-2006 is presented in **Table-1**

**Table-1. Land Use**

| S. No. | Category | Area (Ha) | % to the geographical area |
|---|---|---|---|
| 1 | Forest | 86000 | 6.08 |
| 2 | Barren & Uncultivable land | 90000 | 6.37 |
| 3 | Land put to non-agricultural use | 120000 | 8.50 |
| 4 | Cultivable waste | 28000 | 1.98 |
| 5 | Permanent pastures and other grazing lands | 66000 | 4.69 |
| 6 | Miscellaneous tree crops and groves not included in the net area son | 9000 | 0.63 |
| 7 | Other fallow lands | 180000 | 12.73 |
| 8 | Current fallows | 305000 | 21.58 |
| 9 | Net area sown | 538000 | 38.07 |
| 10 | Total cropped area | 686000 | 48.55 |
| 11 | Area sown more than once | 148000 | 10.47 |

The neat area sown is about 36.60% and the total cropped area is 48.55% of total geographical area of the District.

### 1.5. Irrigation:

The total gross area irrigated by various sources in 2005-2006 stood at 374000 ha, out of which the area irrigated by ground water resources was 199000 ha, which constitutes 53.20% to total gross irrigated area, whereas the area under surface water irrigation was 166000 ha., which accounts for 44.38% to gross irrigated area. The total net irrigated area was about 243000 ha, which constitutes 17..2% of geographical area (1412886 ha)

Ground water plays a predominant role in the net irrigated area by constituting to 57.20%, whereas surface water irrigation accounts for 38.63%. The details of the source-wise irrigation pattern is presented in **Table –2**

**Table-2: Area irrigated by different sources**

| S. No. | Source | Gross area (in 000' ha) | % total gross area | Net area (000'Ha.) | % to total Net area |
|---|---|---|---|---|---|
| 1 | Tanks | 30 | 8 | 19 | 7.8 |
| 2 | Canals | 128 | 34.22 | 75 | 30.86 |
| 3 | Tube well and filter point wells | 133 | 35.56 | 93 | 38.27 |
| 4 | Dug wells | 66 | 17.64 | 46 | 18.93 |
| 5 | Surface water | 166 | 44.38 | 98 | 40.32 |
| 6 | Ground water | 199 | 53.2 | 139 | 57.2 |

### 1.6 Cropping Pattern

The cropping pattern is always practised with respect to climatic conditions and availability of irrigation sources. Paddy has been a staple crop since ages in the agrarian district, which is mostly grown under canals, tanks and wells. Other principle crops like jowar, bajra, grams, are mostly rainfed crops.

The commercial crops like chillies, cotton and groundnut are grown under irrigation. In food crops, the paddy was grown in gross was 1292692 ha, which accounts for 33.9% total sown gross principle crops in the district. The net area sown is about 36.60% and the total cropped area is 42.7% of total geographical area of the district.

**1.7 Studies and activities by CGWB:** Central Ground Water Board, Ministry of Water Resources, Govt. of India, has been carrying out ground water studies since 1967, which includes basic systematic hydrogeological studies, periodical reappraising the resource estimation and ground water exploration. The Board has constructed 40 water table wells down to depth of 30 m for monitoring water levels and 98 deep exploratory bore wells down to 300 m to study hydrological parameters and ground water regime. Ground water level measurements are being carried out four times in a year and water samples are being collected every year in the month of May and are being analysed in the chemical laboratory of Hyderabad. The micro level studies were also carried out in the Fluoride affected areas. In addition, the Board is also carrying out ground water exploration by drilling deep tube wells down to the depth of 200 m in order to study various hydrogeological and hydrological parameters of the ground water regime. Conjunctive Use Studies are also carried out in the canal command area of the District. Piezometer wells were constructed ranging from 20-30 m depth to monitor the water levels.

Mass awareness programmes were also conducted in Suryapet in order to disseminate information to farmers, village assistants, sarpanch, etc. regarding ground water management techniques and artificial recharge techniques in various parts of the District. The district functionaries, NGOs, students, etc., were trained in 2004 in the aspects of ground water management adopting the roof top rain water harvesting and artificial recharge techniques.

## 2.0 RAINFALL

The normal rainfall of Nalgonda district is 753 mm as per the data collected from the 56 revenue rain gauge stations located at Mandal headquarters. The rainfall ranges from 573 mm (Chintapalli) to 900 mm (Tungaturthi).

The Mandal-wise annual rainfall data for crop season from June to May in a year for the period of 2002-2005 is presented in Table-3. The mean rainfall of the district is 628 mm, 693 mm, 450 mm, 753 mm and 520 mm during 2000-01, 2001-02, 2002-03, 2003-04 and 2004-05 respectively. The data shows that there is a deficit of rainfall during the period 2002-2003 and 2004-2005. Cumulative effect of the rainfall departure is 90% less than normal. The year 1998-99 received more than normal rainfall. The departure was highest during the period 1999-2000. The data is presented in Table 3 and **Fig.2.**

## 3.0 GROUND WATER SCENARIO

### 3.1 Hydrogeology

The Archean crystalline rocks, which occupy 90% of the district comprise granites, gneisses, schists and intrusives. The consolidated metasedimentary rocks of Cuddapah and Kurnool system comprising limestones, quartzites and shales occupy 9% in the southern part of the district. The unconsolidated deposits comprising alluvial sands, clay, occur as isolated and narrow patches along the major rivers and streams occupying around 1% of the area.

The crystalline rocks inherently devoid of primary porosity. However, subsequently, with dynamic process of weathering, the rocks undergo fracturing and fissuring and joints over a period of time, lead to the development of secondary porosity, which forms the repository for ground water. The ground water occurs under water table conditions in weathered zone and semi-confined and confined conditions in fractured zone.

## Table 3.

**MANDAL-WISE ANNUAL RAINFALL AND ITS DEPARTURE FROM NORMAL**
**NALGONDA DISTRICT**

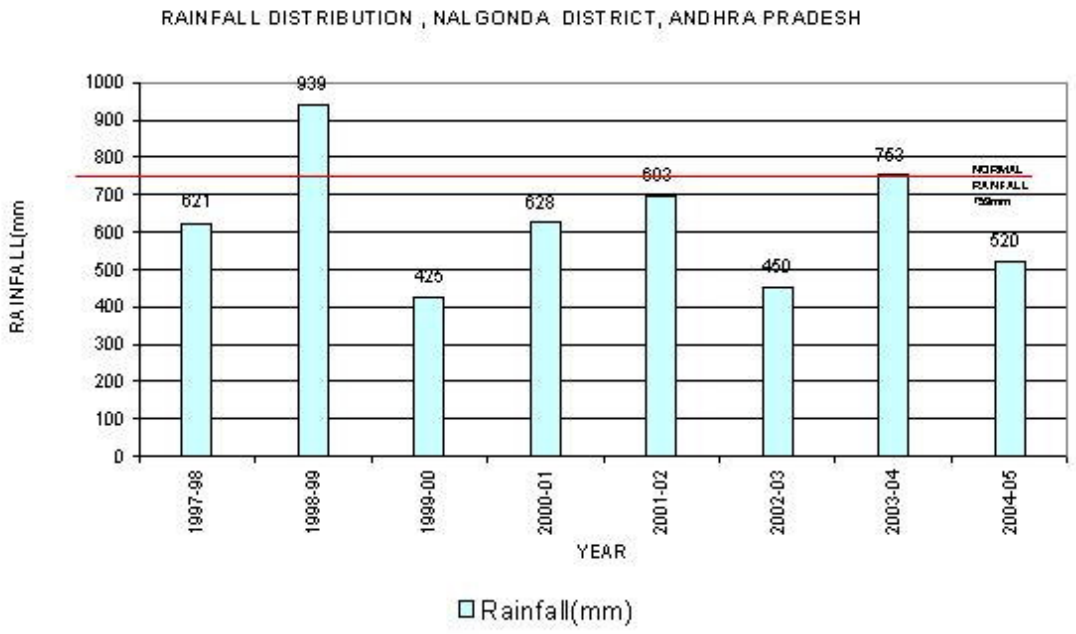
| S NO | MANDAL NAME | RAINFALL(mm) | | | | | | DEPARTURE FROM NORMAL | | | | | CUMMULATIVE DEPARTURE | REMARK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NORMAL | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | | |
| 1 | Alair | 784 | 662 | 620 | 494 | 846 | 639 | -16% | -21% | -37% | 8% | -18% | **-84%** | Scanty |
| 2 | B.Ramaram | 689 | 534 | | 599 | 827 | 721 | -22% | | -13% | 20% | 5% | **-11%** | Normal |
| 3 | Bhongir | 818 | 747 | 707 | 449 | 923 | 783 | -9% | -14% | -45% | 13% | -4% | **-59%** | Deficit |
| 4 | Bibinagar | 786 | 456 | 769 | 554 | 895 | 656 | -42% | -2% | -30% | 14% | -17% | **-76%** | Scanty |
| 5 | Chandur | 778 | 669 | 887 | 444 | 834 | 704 | -14% | 14% | -43% | 7% | -10% | **-45%** | Deficit |
| 6 | Chendampet | 600 | 606 | 503 | 621 | 1097 | 390 | 1% | -16% | 4% | 83% | -35% | **36%** | Excess |
| 7 | Chilkur | 796 | 810 | 740 | 515 | 768 | 411 | 2% | -7% | -35% | -4% | -48% | **-92%** | Scanty |
| 8 | Chintapalle | 573 | | 463 | 299 | 522 | 313 | | -19% | -48% | -9% | -45% | **-121%** | Scanty |
| 9 | Chityal | 719 | 694 | 832 | 393 | 691 | 504 | -3% | 16% | -45% | -4% | -30% | **-67%** | Scanty |
| 10 | Choutuppal | 693 | 442 | 952 | 562 | 799 | 494 | -36% | 37% | -19% | 15% | -29% | **-31%** | Deficit |
| 11 | Damarcherla | 737 | 728 | 721 | 350 | 755 | 521 | -1% | -2% | -53% | 2% | -29% | **-83%** | Scanty |
| 12 | Devarakonda | 639 | 617 | 706 | 604 | 814 | 398 | -3% | 10% | -5% | 27% | -38% | **-9%** | Normal |
| 13 | Garedepalle | 723 | 689 | 635 | 355 | 656 | 410 | -5% | -12% | -51% | -9% | -43% | **-120%** | Scanty |
| 14 | Gundala | 788 | 652 | 624 | 385 | 826 | 481 | -17% | -21% | -51% | 5% | -39% | **-123%** | Scanty |
| 15 | Gundlapalli | 738 | 630 | 535 | 749 | 637 | 508 | -15% | -28% | 1% | -14% | -31% | **-86%** | Scanty |
| 16 | Gurrampod | 553 | 292 | 295 | 214 | 564 | 276 | -47% | -47% | -61% | 2% | -50% | **-203%** | Scanty |
| 17 | Huzurnagar | 789 | 906 | 754 | 519 | 918 | 311 | 15% | -4% | -34% | 16% | -61% | **-68%** | Scanty |
| 18 | Jagireddigudem | 870 | | | 574 | 933 | 485 | | | -34% | 7% | -44% | **-71%** | Scanty |

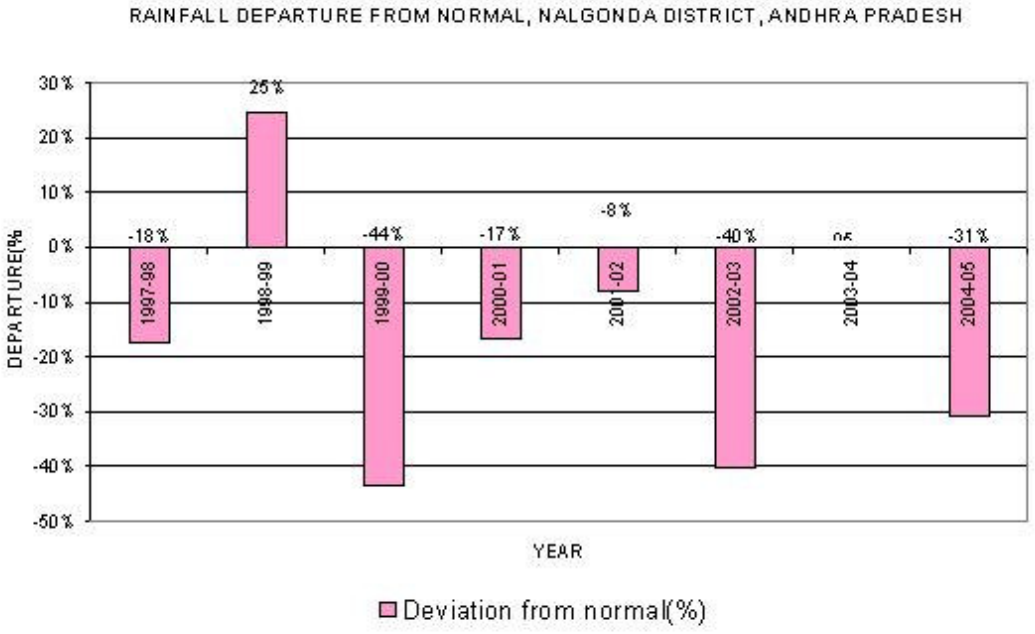
| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | Kanagal | 718 | 541 | 794 | 370 | 679 | 689 | -25% | 11% | -48% | -5% | -4% | **-72%** | **Scanty** |
| 20 | Kattangur | 793 | 389 | 803 | 363 | 821 | 561 | -51% | 1% | -54% | 4% | -29% | **-130%** | **Scanty** |
| 21 | Kethepalle | 872 | 793 | 832 | 452 | 769 | 649 | -9% | -5% | -48% | -12% | -26% | **-99%** | **Scanty** |
| 22 | Kodad | 889 | | | 455 | 824 | 487 | | | -49% | -7% | -45% | **-101%** | **Scanty** |
| 23 | M.Atmakur | 718 | | | 316 | 580 | 375 | | | -56% | -19% | -48% | **-123%** | **Scanty** |
| 24 | M.Turkapalli | 711 | 367 | 516 | 269 | 292 | 287 | -48% | -27% | -62% | -59% | -60% | **-257%** | **Scanty** |
| 25 | Marriguda | 605 | 428 | 515 | 317 | 668 | 384 | -29% | -15% | -48% | 10% | -37% | **-118%** | **Scanty** |
| 26 | Mattampalle | 681 | 648 | 406 | 219 | 495 | 355 | -5% | -40% | -68% | -27% | -48% | **-188%** | **Scanty** |
| 27 | Medlacheruvu | 861 | 791 | 650 | 334 | 1037 | 515 | -8% | -25% | -61% | 20% | -40% | **-114%** | **Scanty** |
| 28 | Miryalaguda | 763 | 867 | 825 | 376 | 904 | 710 | 14% | 8% | -51% | 18% | -7% | **-17%** | Normal |
| 29 | Mothey | 809 | 465 | 420 | 325 | 503 | 374 | -43% | -48% | -60% | -38% | -54% | **-242%** | **Scanty** |
| 30 | Mothkur | 813 | 717 | 708 | 452 | 830 | 606 | -12% | -13% | -44% | 2% | -25% | **-92%** | **Scanty** |
| 31 | Munagala | 828 | 746 | 747 | 554 | 882 | 462 | -10% | -10% | -33% | 7% | -44% | **-90%** | **Scanty** |
| 32 | Munugode | 745 | 569 | 777 | 503 | 651 | 645 | -24% | 4% | -32% | -13% | -13% | **-78%** | **Scanty** |
| 33 | Nadigudem | 871 | 458 | 636 | 464 | 899 | 494 | -47% | -27% | -47% | 3% | -43% | **-161%** | **Scanty** |
| 34 | Nakrekal | 915 | | | 301 | 780 | 510 | | | -67% | -15% | -44% | **-126%** | **Scanty** |
| 35 | Nampally | 622 | 451 | 689 | 368 | 393 | 346 | -27% | 11% | -41% | -37% | -44% | **-139%** | **Scanty** |
| 36 | Narayanpur | 581 | 345 | 777 | 510 | 791 | 276 | -41% | 34% | -12% | 36% | -52% | **-35%** | Deficit |
| 37 | Narketpalle | 701 | 638 | 821 | 566 | 854 | 537 | -9% | 17% | -19% | 22% | -23% | **-13%** | Normal |
| 38 | Nereducherla | 817 | 638 | 794 | 361 | 777 | 645 | -22% | -3% | -56% | -5% | -21% | **-106%** | **Scanty** |
| 39 | Nidamanuru | 726 | 794 | 826 | 431 | 669 | 680 | 9% | 14% | -41% | -8% | -6% | **-32%** | Deficit |
| 40 | Nutankal | 876 | 961 | 777 | 647 | 639 | 373 | 10% | -11% | -26% | -27% | -57% | **-64%** | **Scanty** |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | P.A.Pally | 540 | 364 | 625 | 407 | 497 | 337 | -33% | 16% | -25% | -8% | -38% | **-87%** | **Scanty** |
| 42 | Peddavoora | 682 | 665 | 833 | 541 | 817 | 661 | -2% | 22% | -21% | 20% | -3% | **16%** | Normal |
| 43 | Penpahad | 835 | 324 | 353 | 180 | 266 | 243 | -61% | -58% | -78% | -68% | -71% | **-336%** | **Scanty** |
| 44 | Pochampally | 773 | 688 | 801 | 502 | 266 | 675 | -11% | 4% | -35% | -66% | -13% | **-121%** | **Scanty** |
| 45 | Rajapet | 651 | 392 | 349 | 185 | 345 | 630 | -40% | -46% | -72% | -47% | -3% | **-208%** | **Scanty** |
| 46 | Ramannapet | 649 | 754 | 867 | 558 | 1030 | 566 | 16% | 34% | -14% | 59% | -13% | **82%** | Surplus |
| 47 | S.Atmakur | 771 | | | 492 | 912 | 436 | | | -36% | 18% | -43% | **-61%** | **Scanty** |
| 48 | Shaligowraram | 839 | | | 554 | 1030 | 558 | | | -34% | 23% | -33% | **-45%** | Deficit |
| 49 | Suryapet | 843 | 766 | 739 | 742 | 998 | 694 | -9% | -12% | -12% | 18% | -18% | **-33%** | Deficit |
| 50 | Thungathurthi | 900 | 904 | 684 | 673 | 1078 | 708 | 0% | -24% | -25% | 20% | -21% | **-50%** | Deficit |
| 51 | Tipparti | 722 | 420 | 693 | 266 | 448 | 606 | -42% | -4% | -63% | -38% | -16% | **-163%** | **Scanty** |
| 52 | Tirumalgiri | 932 | 684 | 707 | 431 | 969 | 626 | -27% | -24% | -54% | 4% | -33% | **-133%** | **Scanty** |
| 53 | Tripuraram | 696 | 777 | 912 | 468 | 660 | 714 | 12% | 31% | -33% | -5% | 3% | **7%** | Normal |
| 54 | Valigonda | 785 | 923 | 871 | 698 | 1118 | 445 | 18% | 11% | -11% | 42% | -43% | **17%** | Normal |
| 55 | Vemalapalli | 720 | 758 | 768 | 361 | 910 | 655 | 5% | 7% | -50% | 26% | -9% | **-21%** | Deficit |
| 56 | Yadagirigutta | 815 | | | 496 | 802 | 589 | | | -39% | -2% | -28% | **-68%** | **Scanty** |
| | **MEAN** | **753** | **628** | **693** | **450** | **753** | **520** | **-17%** | **-8%** | **-40%** | **0%** | **-31%** | **-95%** | **Scanty** |

*Source: Directorate of Economics and Statistics, Andhra Pradesh*

**Fig 2.**


RAINFALL DISTRIBUTION , NALGONDA DISTRICT, ANDHRA PRADESH
RAINFALL(mm
1000
900
800
700
600
500
400
300
200
100
0
621
939
425
628
703
450
763
520
NORMAL RAINFALL
1997-98
1998-99
1999-00
2000-01
2001-02
2002-03
2003-04
2004-05
YEAR
Rainfall(mm)


RAINFALL DEPARTURE FROM NORMAL, NALGONDA DISTRICT, ANDHRA PRADESH
DEPARTURE(%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
-18%
25%
-44%
-17%
-8%
-40%
-31%
1997-98
1998-99
1999-00
2000-01
2001-02
2002-03
2003-04
2004-05
YEAR
Deviation from normal(%)

The phreatic aquifer is developed by means of open dug wells with depth ranging from 6-15 m and dug-cum-bore wells up to 45m. From the bottom of dug wells The shallow bore wells are drilled generally to a depth of 50-60 m. The yield of the irrigation wells range between 100 to 150 cu.m/day. At places, it is upto 200 cu.m/day. Hydrogeological conditions of the District are shown in **Fig.3.**

## Ground Water in Meta Sediments

The Meta sedimentary belonging to the Kadapa and Kurnool group occurs along the southern boundary of the district. In the shale formations, the ground water occurs along bedding plains, cleavages, joints and weathered zones etc. In lime stones, the ground water occurs mainly in solution channels, caverns and joints etc. The depth of open wells in shales and limestones varies from 5 to 20 m, whereas the bore wells down to a depth of 50-60 m. As per the yield is concerned, it ranges between 2 and 3 lps.

### Ground Water in Unconsolidated Formations

The unconsolidated sediments like alluvial formations occur along the stream courses. The ground water occurs under water table condition. The major alluvial patch is located along the Aler River between Kolanpaka and Mothkur. The depth of the dug well ranges from 3 to 6 m only.

### 3.2 Shallow Aquifer System:

The Central Ground Water Board so far has constructed 40 shallow bore wells ranging depth from 10.0 m bgl (Munagala) to 35.0 m (Bommalaramaram). The thickness of the weathered mantle ranges between 5.0 and 30.0 m bgl. The depth of phreatic and semi-confined aquifers (fractures) ranges between 7 m (Miryalaguda) and 24 m (Madugulapally). The majority of the aquifer zones encountered within the depth range of 10.0 and 20.0 m bgl. The discharge of the shallow bore wells ranges between 0.5 and 2.0 liters per second (lps). The transmissivity of the wells ranges from 5 to 23 sq.m/day. The aquifers that are encountered in the pink granite are more potential than that of grey granites.


Fig. - 8
HYDROGEOLOGY
NALGONDA DISTRICT
ANDHRA PRADESH
SCALE
N
NALGONDA
LEGEND
FAULT
BASIC DYKE
COLOURED FORMATION
GNEISSIC COMPACT FORMATION
LINEAMENT
DEPTH TO WATER LEVEL
DEPTH DRILLED
ELECTRICAL CONDUCTIVITY
FLUORIDE IN GROUND WATER

The shallow aquifers are exploited by means of large diameter dug wells for irrigation. Yield tests which were conducted on the open wells revealed that specific capacity of the gneissic granite ranges from 41.1 lpm to 260.3 lpm per meter draw down, whereas the wells tapping weathered and jointed gneissic granites have specific capacities vary from 169.3 to 319.7 lpm/dd. The majority values of specific capacity fall in the range of 17.8 to 114.0 lpm/dd.

The depth of shallow aquifer depends on rock type, degree of weathering, geomorphological and drainage conditions. The shallow aquifer system constitutes weathered mantle limited to a maximum depth of 40 m. The shallow aquifer system is normally tapped by dug wells and dug-cum-bore wells. The yield of the wells is generally in the range of 50-100 cu.m/day. The yield of open wells in Aler river basin ranges between 250 to 850 cu.m/day.

## 3.3 Deep Aquifer System

To study the deep aquifer regime, the Central Ground Water Board has sunk about 98 deep wells down to the depth of 200 m in various hydrogeological conditions in the district. The deep exploratory drilling revealed that the fractures are of vertical to sub-vertical and also of horizontal in their disposition. It has been found that about 80% of the aquifer zones are encountered within the range of 40-60 m depth. About 20% of the fractured zones are encountered beyond 60 m down to 150 m depth. In the aquifer zones, within 60m depth, the ground water occurs under semi-confined conditions, whereas in deep seated aquifers found under semi-confined to confined conditions. The transmissivity of aquifer ranges between 5 and 400 sq.m/day (Anantaram, Bhongir mandal). The general range of transmissivity varies from 10 to 60 sq.m/day in the granitic terrain. The specific capacity of the fracture zone ranges from 5.0 lpm/m.dd to 10 lpm/m.dd. The storativity of the aquifer zones is found to be from $1.5 \times 10^{-5}$ to $1 \times 10^{-3}$. It has been observed that the aquifers in the pink granite found to be more potential than that of basic rocks.

Deep aquifers are by and large encountered at a depth of 40-80 m, occasionally fracture zones exist beyond 120 m. The yield of the aquifer ranges between 1 to 4 lps, occasionally upto 19 lps at Anantaram, (Bhongir Mandal), which is located along East West lineament.

### 3.4 Water level

In order to study ground water level and change in storage conditions, a total number of 50 observation wells including 15 open dug wells and 35 purpose-built piezometers, which have been established across the district, are being monitored four times a year including pre-monsoon (May) and post monsoon (November).

**Pre-monsoon**

The water level scenario map for the year 2004-2005 (**Fig.4**) shows that in the north east, south west and north eastern parts, which constitute together 40% of the district, the depth to water level was in the range of 5 to 10 meters below ground level. In the central part, south-west and eastern part, which constitutes about 40% of the district, the water levels were found between 10 and 20 m bgl. The range of 2m to 5 m depth was found as isolated patches in eastern fringe and around southwest boundary in the mandals of Mettampally, Mellacheruvu, Kodad and Nadigudem of the district. The water level of less than 2m was found in Miryalaguda mandal, which indicates the prevalence of water logging conditions in the area.

**Post-monsoon**

Analysis of data of the post-monsoon season of 2005 **(Fig.5)** shows that water level of 2 m was found in almost 30% of the area, covering the mandals of Peddavoora, Nidamanur, Aliya, parts of Devarakonda and Chandampet in the south and Nadigudem, Munagala, Kodad, Chilkur, Garidepalli in eastern part of the district. The water level between 2 and 5 m bgl was found in the central and

Fig. - 4

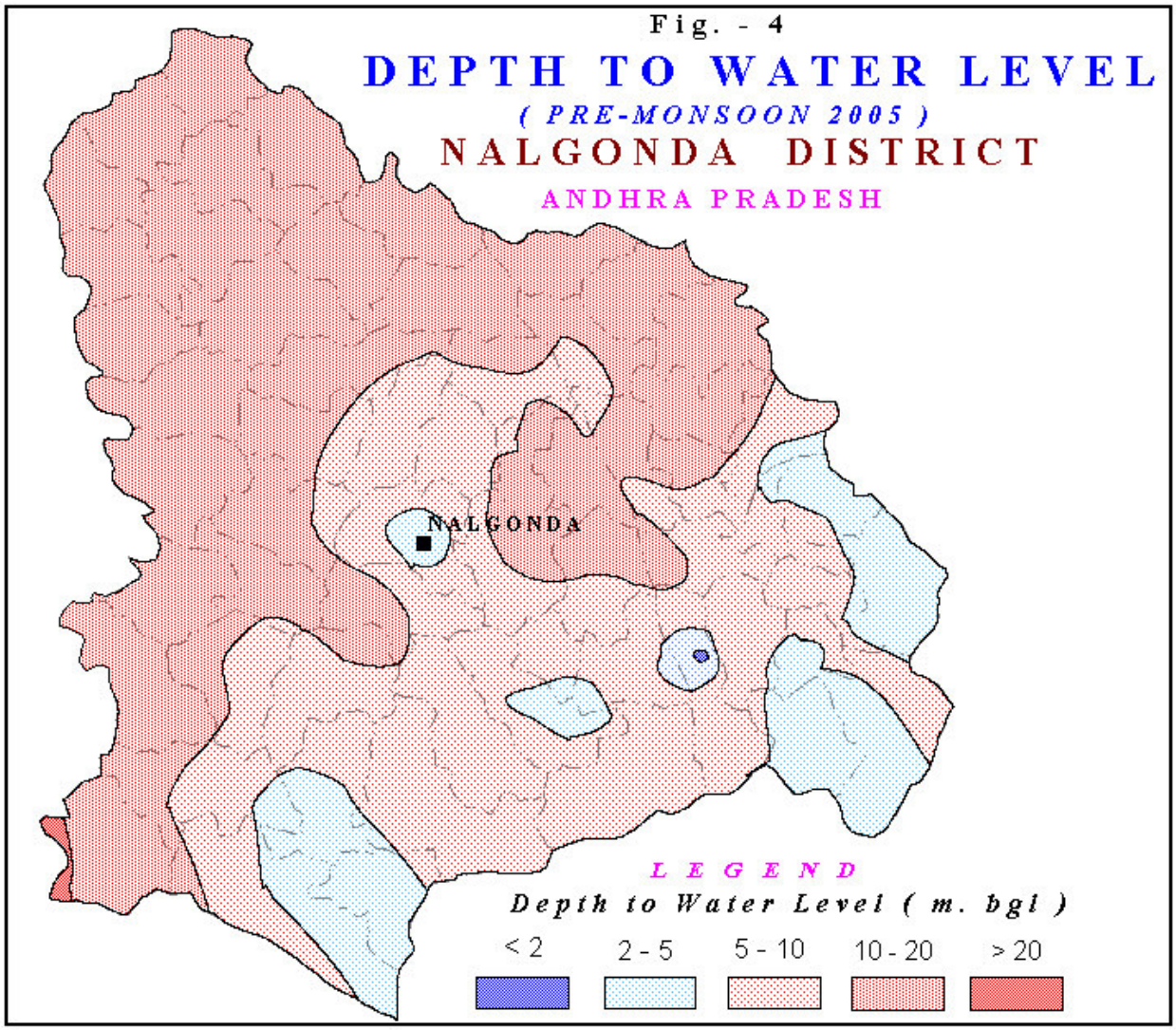
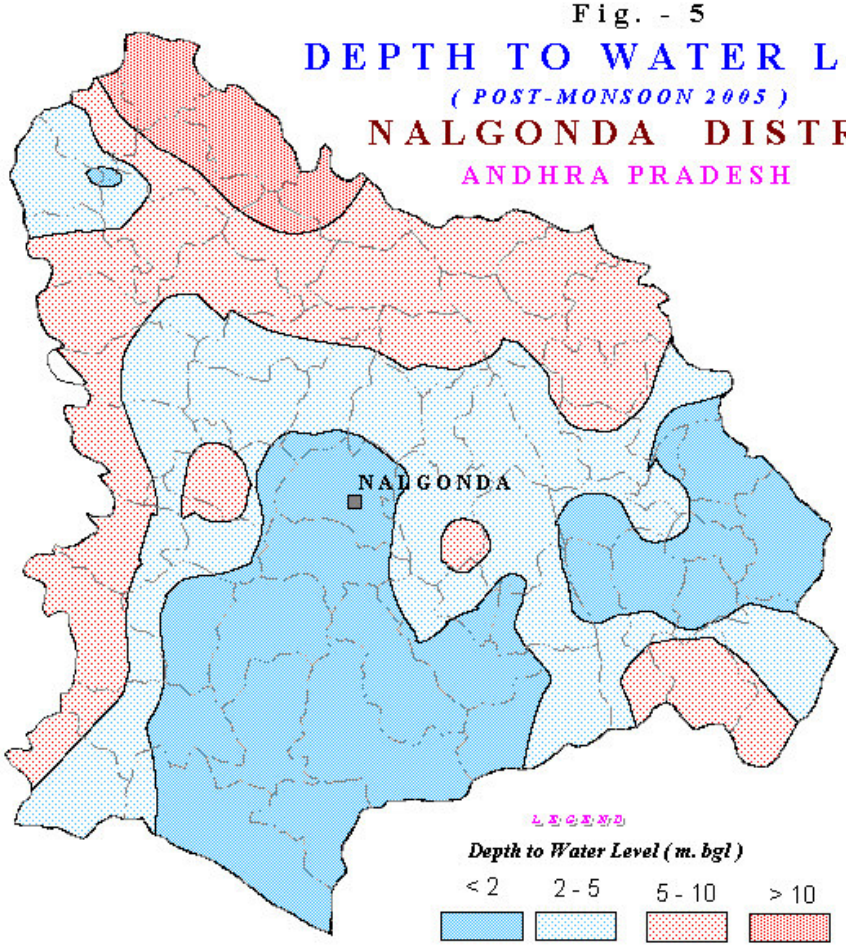

DEPTH TO WATER LEVEL
( PRE-MONSOON 2005 )
NALGONDA DISTRICT
ANDHRA PRADESH
NALGONDA
LEGEND
Depth to Water Level ( m. bgl )
< 2
2 - 5
5 - 10
10 - 20
> 20

Fig. - 5


DEPTH TO WATER LEVEL
( POST-MONSOON 2005 )
NALGONDA DISTRICT
ANDHRA PRADESH
NALGONDA
LEGEND
Depth to Water Level ( m. bgl )
< 2
2 - 5
5 - 10
> 10

eastern parts of the district, covering the mandals of Damarcherla, Miryalaguda, Vemulapalli, Narkatpally, Ketipalli and Suryapet in the eastern part of the district and Bommalaramam in the north-west of the district. The water level between 5 and 10 m bgl was found along the northern and western boundary of the district, covering the mandals of Trimulgerry, Tungaturthi, Gundala, Atmakakur and parts of Marriguda, Chintapally, Narayanpur and Aler. The deep-water levels beyond 10 m were found in northern tip of district, covering the mandals of Rajapet, Aler and Gundala.

**Fluctuation**

Rise of water levels was observed all over the district (**Fig.6**), after the monsoon. Rise of more than 4 m was witnessed almost in 70% of the district, covering entire western and north eastern parts of the district and the rise between 2 and 4 m was found south eastern parts covering the mandals of Damarcherla, Mattampally, Miryalaguda, Mellacheruvu and parts of Kodad and also in the mandals of Rajapet, Aler and Gundala in north of the district. The minimum rise of less than 2 m was found in the parts of Garudepally.

**Long-term water level trends**

An analysis of water level date collected by the C.G.W.B, the network of ground water monitoring wells shows that during the Pre-monsoon, rise in the water is found in 9 wells ranging from 0.01 to 2.05 m/year (Bommalaramaram). Falling trend is observed in 40 wells ranging from 0.157(Nampally) to 1.25 m/year (Chintapally). During the post-monsoon period rising trend in 17 wells ranging from 0.008 (miryalguda) to 3.816 m/year (Huzurnagar). Falling trend is recorded in 34 wells. The annual rising trend found in 12 wells where as falling trend is observed in 38 wells. The pattern of change in water levels with time is shown in the form of hydrographs in **Fig.7**.

Fig. 6

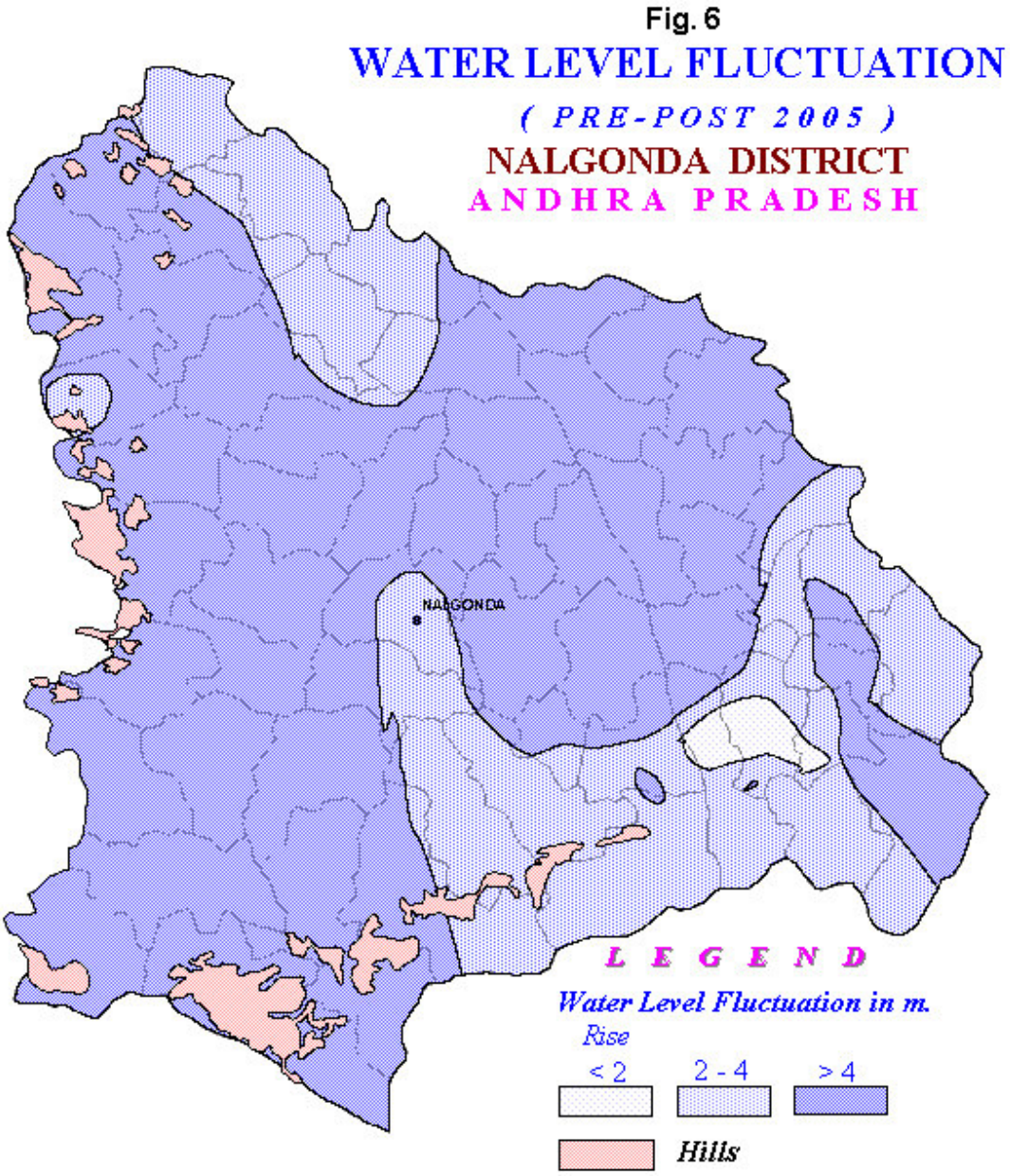
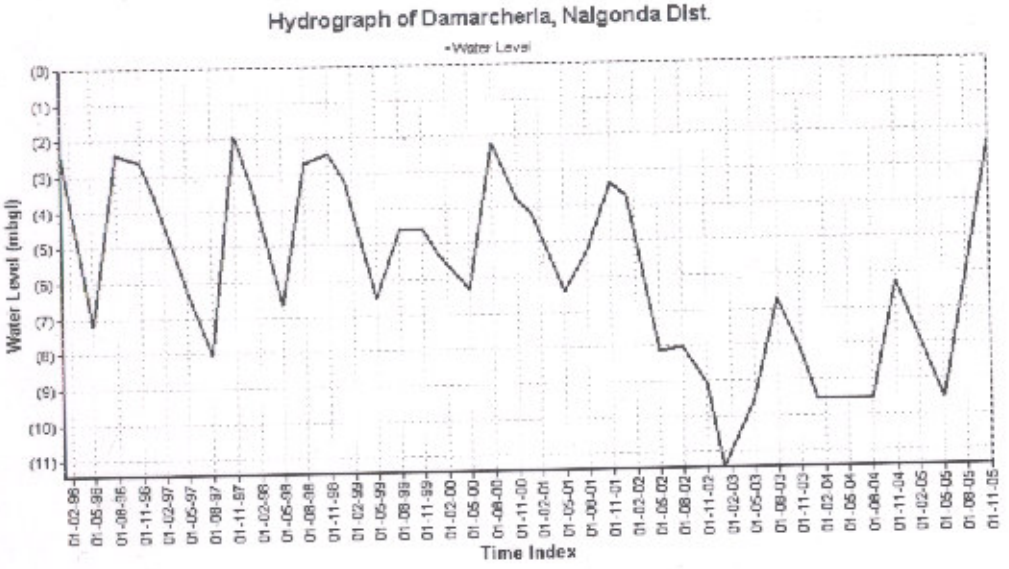
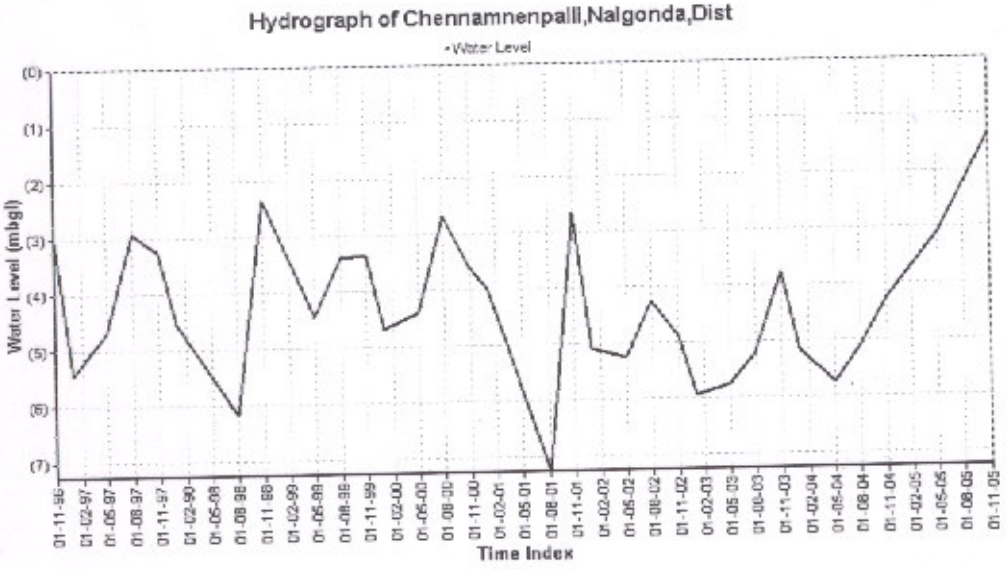

WATER LEVEL FLUCTUATION
( PRE-POST 2005 )
NALGONDA DISTRICT
ANDHRA PRADESH
NALGONDA
LEGEND
Water Level Fluctuation in m.
Rise
< 2
2 - 4
> 4
Hills

Fig-7


Hydrograph of Damarcherla, Nalgonda Dist.
Water Level
Water Level (mbgl)
Time Index


Hydrograph of Chennamnenpalli,Nalgonda,Dist
Water Level
Water Level (mbgl)
Time Index

### 3.5 Ground Water Resources

Based on the Ground Water Estimation committee (G.E.C.-97) norms ground water assessment was done in 2004. The mandal wise details are present in the table-6. The ground water resource available is 694.66 MCM in command area and 1175.43 is in non-command area of the district. The groundwater utilization is in the order of 75.22MCM and 900.09MCM in command area and non-command area respectively. The resultant groundwater balance is 619.44 and 317.56MCM in command and non-command areas respectively. Overall the district falls under safe category with stage of development being at 52%. The stage of development in command area is 11% (safe) and in non-command area it is 77% (semi-critical category). With respect to stage of development, 27 mandals are found to be safe, 24 semi-critical, 3 mandals viz., Pochampally (985%), Chandur (98%) and Mothkur (91%) are critical and 3 mandals viz., Chityal (111%), Rajapet (109%) and Yadigirigutta (104%) are in over-exploited category. Stage of ground water development is shown in **Table-4**.

### 3.6 Ground water quality

In general, the ground water in the district found to be suitable for domestic and irrigation purpose. The general range of Electrical conductivity is between 1500 and 2500 micro Seimen/cm at 25 ..However it was found that Fluoride concentration is more than permissible limits of 1.5 mg/l in the South Western part of Nalgonda district covering the mandals of Deverkonda, Gundlapalem, Chandampet, Chintaplly, Nampally, Gurrampode, Kanagal, Chandur, Marriguda, Munugode, Narayanpur and Narketpally. The quality of groundwater is brackish in the command area in eastern part of the district. In the north-west parts of the district, the fluoride concentration is found to be excessive in isolated patches. So far, 346 villages, are afflicted by Fluoride problem being highest in Nalgonda followed by Nampally and Chintapally mandals. There is brackish water problem in 62 villages spreading across 5 mandals.

**Table 4.**

## MANDAL WISE GROUNDWATER RESOURCE 2004
## NALGONDA DISTRICT, ANDHRA PRADESH

| S.No | Mandal | Area in the basin | | | Ground water availability Ha.m. | | | Ground water utilisation Ha.m. | | | Ground water balance Ha.m. | | | Stage of development % | | | Category | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C | NC | T | C | NC | Total | C | NC | Total | C | NC | Total | C | NC | Total | C | NC | Total |
| *1* | *2* | *3* | *4* | *5* | *3* | | | *4* | | | *5 =( 3-4 )* | | | *6 = {(4/3) * 100}* | | | *7* | | |
| 1 | Alair | 0 | 19791 | 19791 | 0 | 2106 | 2106 | 0 | 1789 | 1789 | 0 | 374 | 374 | NA | 85 | 85 | NA | SC | SC |
| 2 | Anumula | 16909 | 17560 | 34469 | 3864 | 1791 | 5655 | 656 | 960 | 1615 | 3208 | 850 | 4058 | 17 | 54 | 29 | Safe | Safe | Safe |
| 3 | Athmakur(S) | 0 | 21360 | 21360 | 0 | 2652 | 2652 | 0 | 1659 | 1659 | 0 | 1064 | 1064 | NA | 63 | 63 | NA | Safe | Safe |
| 4 | Atmakur(M) | 0 | 23432 | 23432 | 0 | 3047 | 3047 | 0 | 2465 | 2465 | 0 | 679 | 679 | NA | 81 | 81 | NA | SC | SC |
| 5 | B. Ramaram | 0 | 16751 | 16751 | 0 | 2293 | 2293 | 0 | 1891 | 1891 | 0 | 497 | 497 | NA | 82 | 82 | NA | SC | SC |
| 6 | B.Pochampally | 0 | 18397 | 18397 | 0 | 2012 | 2012 | 0 | 1965 | 1965 | 0 | 176 | 176 | NA | 98 | 98 | NA | Cri | Cri |
| 7 | Bhongir | 0 | 24913 | 24913 | 0 | 2868 | 2868 | 0 | 2545 | 2545 | 0 | 443 | 443 | NA | 89 | 89 | NA | SC | SC |
| 8 | Bibinagar | 0 | 18180 | 18180 | 0 | 2185 | 2185 | 0 | 1704 | 1704 | 0 | 604 | 604 | NA | 78 | 78 | NA | SC | SC |
| 9 | Chandampet | 0 | 39065 | 39065 | 0 | 3243 | 3243 | 0 | 2368 | 2368 | 0 | 966 | 966 | NA | 73 | 73 | NA | SC | SC |
| 10 | Chandur | 0 | 20083 | 20083 | 0 | 1739 | 1739 | 0 | 1712 | 1712 | 0 | 102 | 102 | NA | 98 | 98 | NA | Cri | Cri |
| 11 | Chilkur | 11486 | 0 | 11486 | 4496 | 0 | 4496 | 138 | 0 | 138 | 4357 | 0 | 4357 | 3 | NA | 3 | Safe | NA | Safe |
| 12 | Chinthapally | 0 | 27307 | 27307 | 0 | 2219 | 2219 | 0 | 1454 | 1454 | 0 | 921 | 921 | NA | 66 | 66 | NA | Safe | Safe |
| 13 | Chityal | 0 | 23769 | 23769 | 0 | 2189 | 2189 | 0 | 2422 | 2422 | 0 | -69 | -69 | NA | 111 | 111 | NA | OE | OE |
| 14 | Chivemla | 0 | 14867 | 14867 | 0 | 1771 | 1771 | 0 | 1272 | 1272 | 0 | 546 | 546 | NA | 72 | 72 | NA | SC | SC |
| 15 | Choutuppal | 0 | 26392 | 26392 | 0 | 2492 | 2492 | 0 | 2239 | 2239 | 0 | 355 | 355 | NA | 90 | 90 | NA | SC | SC |
| 16 | Dameracharla | 29968 | 4246 | 34214 | 4717 | 275 | 4992 | 719 | 67 | 786 | 3999 | 214 | 4213 | 15 | 24 | 16 | Safe | Safe | Safe |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | Devarakonda | 0 | 34882 | 34882 | 0 | 3185 | 3185 | 0 | 2716 | 2716 | 0 | 621 | 621 | NA | 85 | 85 | NA | SC | SC |
| 18 | Garidepally | 17906 | 1148 | 19054 | 8598 | 113 | 8711 | 647 | 134 | 781 | 7951 | -21 | 7930 | 8 | 118 | 9 | Safe | OE | Safe |
| 19 | Gundala | 0 | 20429 | 20429 | 0 | 2651 | 2651 | 0 | 2263 | 2263 | 0 | 430 | 430 | NA | 85 | 85 | NA | SC | SC |
| 20 | Gundlapally | 0 | 26490 | 26490 | 0 | 2488 | 2488 | 0 | 1973 | 1973 | 0 | 597 | 597 | NA | 79 | 79 | NA | SC | SC |
| 21 | Gurrampode | 0 | 30737 | 30737 | 0 | 2976 | 2976 | 0 | 1875 | 1875 | 0 | 1171 | 1171 | NA | 63 | 63 | NA | Safe | Safe |
| 22 | Huzurnagar | 11047 | 0 | 11047 | 5745 | 0 | 5745 | 302 | 0 | 302 | 5444 | 0 | 5444 | 5 | NA | 5 | Safe | NA | Safe |
| 23 | Jajireddygudem | 0 | 19460 | 19460 | 0 | 2682 | 2682 | 0 | 1748 | 1748 | 0 | 952 | 952 | NA | 65 | 65 | NA | Safe | Safe |
| 24 | Kanagal | 0 | 23356 | 23356 | 0 | 2495 | 2495 | 0 | 2315 | 2315 | 0 | 247 | 247 | NA | 93 | 93 | NA | Cri | Cri |
| 25 | Kattangur | 0 | 19025 | 19025 | 0 | 2039 | 2039 | 0 | 1288 | 1288 | 0 | 840 | 840 | NA | 63 | 63 | NA | Safe | Safe |
| 26 | Kethepalli | 0 | 14865 | 14865 | 0 | 1657 | 1657 | 0 | 1326 | 1326 | 0 | 390 | 390 | NA | 80 | 80 | NA | SC | SC |
| 27 | Kodad | 24252 | 0 | 24252 | 6704 | 0 | 6704 | 661 | 0 | 661 | 6043 | 0 | 6043 | 10 | NA | 10 | Safe | NA | Safe |
| 28 | Marriguda | 0 | 22989 | 22989 | 0 | 1941 | 1941 | 0 | 1254 | 1254 | 0 | 758 | 758 | NA | 65 | 65 | NA | Safe | Safe |
| 29 | Mattampally | 12550 | 5116 | 17666 | 2321 | 319 | 2640 | 422 | 126 | 548 | 1899 | 193 | 2092 | 18 | 40 | 21 | Safe | Safe | Safe |
| 30 | Mellachervu | 24587 | 10089 | 34676 | 5022 | 688 | 5710 | 233 | 118 | 352 | 4789 | 570 | 5358 | 5 | 17 | 6 | Safe | Safe | Safe |
| 31 | Miryalguda | 23325 | 1044 | 24369 | 3563 | 93 | 3657 | 361 | 63 | 423 | 3203 | 36 | 3238 | 10 | 67 | 12 | Safe | Safe | Safe |
| 32 | Mothey | 0 | 18131 | 18131 | 0 | 2218 | 2218 | 0 | 1769 | 1769 | 0 | 487 | 487 | NA | 80 | 80 | NA | SC | SC |
| 33 | Mothkur | 0 | 28005 | 28005 | 0 | 3832 | 3832 | 0 | 3492 | 3492 | 0 | 484 | 484 | NA | 91 | 91 | NA | Cri | Cri |
| 34 | Munagala | 7314 | 8550 | 15864 | 1679 | 1002 | 2681 | 653 | 751 | 1404 | 1026 | 268 | 1294 | 39 | 75 | 52 | Safe | SC | Safe |
| 35 | Munugode | 0 | 22253 | 22253 | 0 | 1902 | 1902 | 0 | 1636 | 1636 | 0 | 355 | 355 | NA | 86 | 86 | NA | SC | SC |
| 36 | Nadigudem | 10725 | 5522 | 16247 | 2768 | 668 | 3437 | 887 | 337 | 1224 | 1881 | 349 | 2230 | 32 | 50 | 36 | Safe | Safe | Safe |
| 37 | Nakrekal | 0 | 14889 | 14889 | 0 | 1474 | 1474 | 0 | 1252 | 1252 | 0 | 353 | 353 | NA | 85 | 85 | NA | SC | SC |
| 38 | Nalgonda | 0 | 32246 | 32246 | 0 | 3667 | 3667 | 0 | 2641 | 2641 | 0 | 1090 | 1090 | NA | 72 | 72 | NA | SC | SC |
| 39 | Nampally | 0 | 26995 | 26995 | 0 | 2262 | 2262 | 0 | 1998 | 1998 | 0 | 358 | 358 | NA | 88 | 88 | NA | SC | SC |
| 40 | Narketpally | 0 | 24349 | 24349 | 0 | 2679 | 2679 | 0 | 1961 | 1961 | 0 | 793 | 793 | NA | 73 | 73 | NA | SC | SC |
| 41 | Neredcherla | 21564 | 6175 | 27739 | 12233 | 427 | 12660 | 1231 | 267 | 1498 | 11002 | 162 | 11163 | 10 | 63 | 12 | Safe | Safe | Safe |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42 | Nidmanoor | 12911 | 12951 | 25862 | 3006 | 1465 | 4472 | 260 | 1129 | 1389 | 2746 | 386 | 3132 | 9 | 77 | 31 | Safe | SC | Safe |
| 43 | Nuthankal | 0 | 20494 | 20494 | 0 | 2851 | 2851 | 0 | 2224 | 2224 | 0 | 716 | 716 | NA | 78 | 78 | NA | SC | SC |
| 44 | P A Pally | 0 | 31230 | 31230 | 0 | 3005 | 3005 | 0 | 2232 | 2232 | 0 | 990 | 990 | NA | 74 | 74 | NA | SC | SC |
| 45 | Peddavoora | 0 | 46577 | 46577 | 0 | 4177 | 4177 | 0 | 1944 | 1944 | 0 | 2391 | 2391 | NA | 47 | 47 | NA | Safe | Safe |
| 46 | Penpahad | 1162 | 17385 | 18547 | 752 | 1528 | 2280 | 59 | 1009 | 1068 | 693 | 550 | 1243 | 8 | 66 | 47 | Safe | Safe | Safe |
| 47 | Rajapet | 0 | 19667 | 19667 | 0 | 1850 | 1850 | 0 | 2022 | 2022 | 0 | -113 | -113 | NA | 109 | 109 | NA | OE | OE |
| 48 | Ramannapet | 0 | 21148 | 21148 | 0 | 2401 | 2401 | 0 | 2258 | 2258 | 0 | 224 | 224 | NA | 94 | 94 | NA | Cri | Cri |
| 49 | Saligowaraam | 0 | 20541 | 20541 | 0 | 2538 | 2538 | 0 | 1696 | 1696 | 0 | 937 | 937 | NA | 67 | 67 | NA | Safe | Safe |
| 50 | S.Narayanpur | 0 | 20854 | 20854 | 0 | 1710 | 1710 | 0 | 1274 | 1274 | 0 | 587 | 587 | NA | 74 | 74 | NA | SC | SC |
| 51 | Suryapet | 0 | 20826 | 20826 | 0 | 2348 | 2348 | 0 | 1607 | 1607 | 0 | 809 | 809 | NA | 68 | 68 | NA | Safe | Safe |
| 52 | Thipparthy | 0 | 25480 | 25480 | 0 | 2375 | 2375 | 0 | 1718 | 1718 | 0 | 773 | 773 | NA | 72 | 72 | NA | SC | SC |
| 53 | Thungathurthy | 0 | 20696 | 20696 | 0 | 2871 | 2871 | 0 | 2016 | 2016 | 0 | 1006 | 1006 | NA | 70 | 70 | NA | SC | SC |
| 54 | Thurkapally | 0 | 19319 | 19319 | 0 | 2130 | 2130 | 0 | 1746 | 1746 | 0 | 479 | 479 | NA | 82 | 82 | NA | SC | SC |
| 55 | Tirmalgiri | 0 | 16887 | 16887 | 0 | 2355 | 2355 | 0 | 1615 | 1615 | 0 | 770 | 770 | NA | 69 | 69 | NA | Safe | Safe |
| 56 | Tripuraram | 14065 | 3318 | 17383 | 2746 | 320 | 3066 | 173 | 179 | 353 | 2572 | 152 | 2725 | 6 | 56 | 12 | Safe | Safe | Safe |
| 57 | Vemulapalli | 3933 | 16935 | 20868 | 1251 | 1588 | 2840 | 120 | 1020 | 1140 | 1132 | 616 | 1748 | 10 | 64 | 40 | Safe | Safe | Safe |
| 58 | Voligonda | 0 | 29268 | 29268 | 0 | 3564 | 3564 | 0 | 2376 | 2376 | 0 | 1294 | 1294 | NA | 67 | 67 | NA | Safe | Safe |
| 59 | Yadagirigutta | 0 | 22694 | 22694 | 0 | 2126 | 2126 | 0 | 2220 | 2220 | 0 | -15 | -15 | NA | 104 | 104 | NA | OE | OE |
| | **Total** | **243704** | **1119128** | **1362832** | **69466** | **117543** | **187008** | **7522** | **90099** | **97620** | **61944** | **31756** | **93700** | **11** | **77** | **52** | **Safe** | **SC** | **Safe** |

Note: OE = Over exploited; Cri = Critical; SC = Semi critical; C = Command; NC = Non command; NA = Not applicable

### 3.7 Status of Ground Water Development:

Ground water development in the district is carried out through bore wells of 60 to 80m depth and through shallow tube well 40 m depth in the non-command area and through the dug wells of 10 to12m depth in the command area. In the sedimentary terrain of lime stones, the groundwater is tapped through deep wells of about 80m depth and through filter points with depth range from 10 to 15 m along the banks Alair and Kanagal rivers. The district is largely dependent on groundwater for irrigation requirement as 64.5% of area which accounts for 1,39,000 ha., irrigated by ground water resources with a total number of 1,54,936 ground water extraction structures. To meet the domestic and drinking water needs of the 1136 inhabitant villages about 10,228 groundwater extraction structures are constructed under the control of Panchayat Raj Department. The details of the drinking water facilities are presented in **Table-5**.

Large diameter dug wells either of rectangular or circular shape are found in the district for irrigation purpose. The depth of the dug wells vary from 8 to 15 m bgl in non-command area, but most of the wells are dried up or with deep water levels in the summer. These wells have 1-2 m water column, which would sustain pumping for 2-4 hrs. in two spells a day, by 5 H.P motor. The yield of the wells varies from 100 to 200 cu.m/day during post-monsoon period.

The depth of bore wells vary between 40 and 60 m in non-command area to tap fractured aquifers, whose discharge would be 2 lps to 5 lps, with draw down of 6-10 m for a pumping period of about 6 hours.

The depths of dug wells in command area vary from 8-10 m with yield from 75-200 cu.m/day. Post monsoon period with 3-5 m draw down.

Table - - 5

STATEMENT SHOWING MANDAL-WISE WELL DENSITY IN NALGONDA DISTRICT, ANDHRA PRADESH

| S No | Mandal Name | Geographical in Ha. | No. of wells | Well Density per Sq.Km. | Remark |
|---|---|---|---|---|---|
| 1 | Alair | 23398 | 3186 | 14 | |
| 2 | Anumala(Halia) | 32917 | 1195 | 4 | |
| 3 | Arvapally | 20188 | 2940 | 15 | |
| 4 | Athmakur(M) | 23614 | 3707 | 16 | No Scope for Development |
| 5 | Athmakur(S) | 20853 | 3291 | 16 | No Scope for Development |
| 6 | B.Ramaram | 16950 | 2017 | 12 | |
| 7 | Bhongir | 29358 | 5730 | 20 | No Scope for Development |
| 8 | Bibinagar | 21957 | 2088 | 10 | |
| 9 | Chandampet | 47831 | 2847 | 6 | |
| 10 | Chandur | 20268 | 3136 | 15 | |
| 11 | Chilkur | 11897 | 243 | 2 | |
| 12 | Chintapally | 27217 | 2620 | 10 | |
| 13 | Chityal | 23758 | 4838 | 20 | No Scope for Development |
| 14 | Chivvemla | 15114 | 2967 | 20 | No Scope for Development |
| 15 | Choutuppal | 26674 | 3347 | 13 | |
| 16 | Deverkonda | 36055 | 3395 | 9 | |
| 17 | Damarcherla | 35055 | 1093 | 3 | |
| 18 | Garidepally | 20144 | 1009 | 5 | |
| 19 | Gundala | 20429 | 3940 | 19 | No Scope for Development |
| 20 | Gundlapally | 26787 | 2496 | 9 | |
| 21 | Gurrampode | 30689 | 2401 | 8 | |
| 22 | Huzurnagar | 12792 | 582 | 5 | |
| 23 | Kanagal | 23577 | 2877 | 12 | |
| 24 | Kattangur | 19017 | 2499 | 13 | |
| 25 | Kethepally | 15040 | 2819 | 19 | No Scope for Development |
| 26 | Kodad | 23411 | 1477 | 6 | |
| 27 | Marriguda | 23222 | 2487 | 11 | |
| 28 | Mattampally | 19368 | 1033 | 5 | |
| 29 | Mellacheruvu | 36375 | 674 | 2 | |
| 30 | Miryalguda | 25601 | 929 | 4 | |
| 31 | Mothey | 18598 | 4743 | 26 | No Scope for Development |
| 32 | Mothkur | 28876 | 4065 | 14 | |
| 33 | Munagala | 16117 | 3356 | 21 | No Scope for Development |
| 34 | Munugode | 23213 | 2967 | 13 | |
| 35 | Nadigudem | 16609 | 1759 | 11 | |
| 36 | Nakrekal | 15122 | 3379 | 22 | No Scope for Development |
| 37 | Nalgonda | 32260 | 5134 | 16 | No Scope for Development |
| 38 | Nampally | 29720 | 3417 | 11 | |
| 39 | Narayampuram | 25572 | 3214 | 13 | |
| 40 | Narketpally | 24735 | 3509 | 14 | |
| 41 | Nereducharla | 27186 | 174 | 1 | |
| 42 | Nidmanur | 27120 | 1596 | 6 | |
| 43 | Nuthankal | 20977 | 3926 | 19 | No Scope for Development |
| 44 | P.A.Pally | 31591 | 3076 | 10 | |
| 45 | Peddavoora | 50296 | 2385 | 5 | |
| 46 | Penpahad | 19384 | 3017 | 16 | No Scope for Development |
| 47 | Pochampally | 19218 | 2067 | 11 | |
| 48 | Rajapet | 19516 | 2947 | 15 | |
| 49 | Ramannpet | 22755 | 2976 | 13 | |
| 50 | Shaligouraram | 21495 | 3217 | 15 | |
| 51 | Suryapet | 21279 | 3876 | 18 | No Scope for Development |
| 52 | Thipparthy | 25486 | 3193 | 13 | |
| 53 | Thungathurthy | 20859 | 4529 | 22 | No Scope for Development |
| 54 | Thurkapally | 19295 | 3732 | 19 | No Scope for Development |
| 55 | Tirmalgiri | 17290 | 3208 | 19 | No Scope for Development |
| 56 | Tripuraram | 18155 | 1128 | 6 | |
| 57 | Valigonda | 29167 | 4364 | 15 | |
| 58 | Vemulapally | 20947 | 2161 | 10 | |
| 59 | Yadigirigutta | 22699 | 3419 | 15 | |

**Well density**

The highest well density of 26 wells/sq.km is found in Mothey mandal of non-command area and the lowest density of 1 well per sq.km in the Neruducherla mandal (canal command area). A well density of 16 and above is observed in 17 mandals in non-command area and 5 in canal command area. The well density stands at 12 wells per sq./km in the district as a whole (**Table-6**).

## 4.0 GROUND WATER MANAGEMENT STRATEGY

Ever-declining ground water levels as a result of frequent dry spells and indiscreet sinking of bore wells, the ground water resources have been depleting and pushing the ground water scenario to the point of no return. In order to arrest the grave situation an effective groundwater management strategy shall be evolved in such a way that there is an optimal utilization of ground water resources maintaining the well spacing norms. Spacing norm for two adjacent bore wells in crystalline rocks is 250 m. As per the stage of development, the mandals of Pochampally, Chandur, Mothkur and Ramannpet of non-command area have been categorized as critical ones, leaving no room for further groundwater exploitation.

The district has considerable command area spreading over 16 mandals and as many mandals are falling under safe category with a ground water balance of 619.44 MCM for development. In command area, the ground water development may be taken up by utilising ground water in conjunction with surface water for construction of shallow bore wells in order to enhance irrigation potential, reduce water logging conditions and to improve ground water quality as well. The farmers in the tail end areas of canal ayacut will also be benefited to a large extent if the ground water development is encouraged in the canal head-reaches. This will satisfy the equitable distribution of water resources to the farmers in the command area.

Table No.23.7

Table-6

MANDAL-WISE DRINKING WATER FACILITIES IN VILLAGES FOR THE YEAR 2004-2005 (as on 31-03-2005)

| Sl. No | Name of the Mandal | Total inhabited Villages (No.) | Villages having Adequate Drinking Water facility (No.) | | | | Problematic Villages | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | P.W.S. | Bore Wells | Open Wells | Others | Floirde Villages | Brakish Water | Not having Drinking water facility |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | ALAIR | 14 | 14 | 14 | 0 | 0 | 6 | 0 | 0 |
| 2 | ANUMULA(HALIYA) | 25 | 13 | 377 | 0 | 68 | 7 | 0 | 0 |
| 3 | ATHMAKUR(M) | 21 | 39 | 339 | 0 | 9 | 0 | 0 | 0 |
| 4 | ATHMAKUR(S) | 19 | 20 | 0 | 20 | 0 | 0 | 0 | 0 |
| 5 | BHONGIR | 29 | 29 | 323 | 0 | 6 | 0 | 0 | 0 |
| 6 | BIBINAGAR | 25 | 25 | 23 | 0 | 0 | 0 | 0 | 0 |
| 7 | BOMMALARAMARAM | 23 | 21 | 25 | 4 | 0 | 5 | 0 | 0 |
| 8 | CHANDAMPET | 23 | 11 | 23 | 6 | 0 | 0 | 0 | 0 |
| 9 | CHANDOOR | 17 | 17 | 284 | 0 | 7 | 7 | 0 | 0 |
| 10 | CHILKUR | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 |
| 11 | CHINTHAPALLY | 22 | 15 | 22 | 0 | 0 | 22 | 0 | 0 |
| 12 | CHITYAL | 16 | 16 | 16 | 0 | 0 | 4 | 0 | 0 |
| 13 | CHIVEMULA | 15 | 15 | 323 | 34 | 52 | 5 | 0 | 0 |
| 14 | CHOUTUPPAL | 17 | 17 | 17 | 0 | 0 | 12 | 0 | 0 |
| 15 | DAMARACHERLA | 17 | 13 | 17 | 17 | 0 | 0 | 0 | 0 |
| 16 | DEVARAKONDA | 28 | 14 | 519 | 0 | 0 | 28 | 0 | 0 |
| 17 | GARIDEPALLY | 11 | 11 | 11 | 6 | 0 | 0 | 0 | 0 |
| 18 | GUNDALA | 20 | 10 | 10 | 0 | 0 | 0 | 0 | 0 |
| 19 | GUNDLAPALLY(DINDI) | 20 | 16 | 20 | 20 | 0 | 0 | 0 | 0 |
| 20 | GURRAMPODE | 27 | 27 | 342 | 0 | 0 | 8 | 0 | 0 |
| 21 | HUZURNAGAR | 7 | 7 | 340 | 39 | 32 | 0 | 0 | 0 |
| 22 | JAJIREDDYGUDEM | 14 | 14 | 250 | 50 | 0 | 0 | 0 | 0 |
| 23 | KANAGAL | 26 | 24 | 335 | 1 | 39 | 16 | 0 | 0 |
| 24 | KATTANGOOR | 17 | 15 | 2 | 0 | 0 | 0 | 0 | 0 |
| 25 | KETHEPALLY | 13 | 13 | 13 | 0 | 0 | 0 | 0 | 0 |
| 26 | KODAD | 16 | 14 | 16 | 16 | 0 | 0 | 0 | 0 |
| 27 | MARRIGUDA | 17 | 17 | 267 | 0 | 7 | 17 | 0 | 0 |
| 28 | MATTAMPALLY | 10 | 8 | 245 | 122 | 0 | 0 | 0 | 0 |
| 29 | MELLACHERUVU | 14 | 14 | 320 | 2 | 42 | 0 | 0 | 0 |
| 30 | MIRYALAGUDA | 24 | 14 | 10 | 0 | 0 | 0 | 0 | 0 |
| 31 | MOTHEY | 16 | 16 | 228 | 0 | 0 | 7 | 0 | 0 |
| 32 | MOTHKUR | 23 | 19 | 420 | 25 | 0 | 0 | 0 | 0 |
| 33 | MUNAGALA | 11 | 11 | 11 | 7 | 0 | 0 | 1 | 0 |
| 34 | MUNUGODE | 21 | 21 | 47 | 0 | 0 | 21 | 0 | 0 |
| 35 | NADIGUDEM | 16 | 10 | 16 | 3 | 0 | 0 | 0 | 0 |
| 36 | NAKREKAL | 16 | 16 | 365 | 8 | 0 | 5 | 11 | 0 |
| 37 | NALGONDA | 29 | 29 | 29 | 0 | 0 | 29 | 0 | 0 |
| 38 | NAMPALLY | 28 | 28 | 28 | 1 | 12 | 28 | 28 | 0 |
| 39 | NARAYANAPURAM | 14 | 14 | 0 | 0 | 0 | 14 | 0 | 0 |
| 40 | NARKETPALLY | 19 | 19 | 374 | 1 | 0 | 19 | 0 | 0 |
| 41 | NEREDCHERLA | 27 | 27 | 27 | 0 | 0 | 0 | 0 | 0 |
| 42 | NIDMANOOR | 19 | 19 | 19 | 16 | 0 | 7 | 0 | 0 |
| 43 | NUTHANKAL | 21 | 13 | 21 | 1 | 0 | 3 | 0 | 0 |
| 44 | P.A.PALLY | 22 | 12 | 22 | 22 | 0 | 5 | 0 | 0 |
| 45 | PEDDAVOORA | 24 | 7 | 24 | 23 | 0 | 14 | 0 | 0 |
| 46 | PENPAHAD | 17 | 8 | 309 | 2 | 0 | 4 | 0 | 0 |
| 47 | POCHAMPALLY | 23 | 22 | 23 | 0 | 0 | 0 | 0 | 0 |
| 48 | RAJAPET | 19 | 17 | 192 | 1 | 9 | 0 | 0 | 0 |
| 49 | RAMANNAPET | 21 | 21 | 382 | 0 | 0 | 17 | 4 | 0 |
| 50 | SHALIGOURARAM | 19 | 19 | 250 | 5 | 0 | 19 | 15 | 0 |
| 51 | SURYAPET | 17 | 10 | 288 | 6 | 0 | 0 | 0 | 0 |
| 52 | THIPPARTHY | 19 | 19 | 370 | 0 | 0 | 4 | 0 | 0 |
| 53 | THUNGATHURTHY | 20 | 20 | 20 | 0 | 0 | 0 | 0 | 0 |
| 54 | THURKAPALLY | 22 | 22 | 226 | 0 | 0 | 0 | 0 | 0 |
| 55 | TIRUMALAGIRI | 16 | 16 | 16 | 0 | 0 | 0 | 0 | 0 |
| 56 | TRIPURARAM | 19 | 9 | 131 | 20 | 0 | 0 | 3 | 0 |
| 57 | VALIGONDA | 27 | 27 | 359 | 0 | 0 | 3 | 0 | 0 |
| 58 | VEMULAPALLY | 23 | 21 | 23 | 10 | 4 | 0 | 0 | 0 |
| 59 | YADAGIRIGUTTA | 17 | 17 | 17 | 0 | 0 | 10 | 0 | 0 |
| | TOTAL | 1136 | 996 | 8744 | 488 | 287 | 346 | 62 | 0 |

Source: Mandal Revenue Officers in the District.

In the hard rock terrain of non-command area it is imperative to augment the depleting groundwater resources by evolving artificial recharge strategy in order to sustain the existing ground water extraction structures. The indiscreet 'trend' of sinking bore wells needs to arrested through administrative measures or even legal measures which are already existing in APWALTA Act. But, much effort has to be made in bringing awareness among public/farmers to desist from the present trend and follow the scientific guidelines through the designated Departments.

## 4.1 Ground Water Development

Further groundwater development in the district should be restricted to the command area, by constructing dug wells of 10 to 15 m depth with radius of about 5m or shallow borewells of 165mm dia.down to a depth of 30 to 40 m in the areas having water levels less than 5m below ground level. The selection of bore well site shall be made consciously based on Geophysical and hydrogeological studies. The unit cost of a dug well and bore well would be around in the order of Rs. 44,500 and Rs.12,500 to 15,000 (Source: NABARD) respectively. The details of the spacing norms are furnished in Table7 and unit cost of ground water abstraction structures is presented in **Table-7**.

### Table-7: Spacing norms for different ground water abstraction structures

| Sl. No | Situation | Spacing between any two wells (m) | | | |
|---|---|---|---|---|---|
| | | Piccota wells | Dug wells | Filter point or shallow wells | Bore wells |
| 1 | Non-Ayacut | 60 | 160 | 120 | 250-300 |
| 2 | Ayacut | 40 | 100 | 160 | 150-200 |
| 3 | Near perennial source lke river of tank (within 200m) | 40 | 100 | 160 | 200-300 |
| 4 | Non-perennial streams | 50 | 150 | 180 | 200-500 |

The details of ground water structures and designs in different geological formations with unit cost are presented in **Table-8**.

**Table-8: Unit cost of ground water abstraction structures.**

| S. No. | Geological Formation | Type of MI Source | Dimensions | | Staining Depth (m) | Dimensions Of bore well | | Unit cost (Rs.) |
|---|---|---|---|---|---|---|---|---|
| | | | Dia (m) | Depth (m) | | Dia (mm) | Depth (m) | |
| 1 | Granite related rocks | DW | 5 | 16 | 4 | - | - | 44500 |
| | | DCB | 6 | 10 | 4 | 100 | 30 | 31000 |
| | | DCB | 4 | 14 | 4 | 100 | 30 | 39400 |
| 2 | Lime stones | DCB | 4 | 12 | 4 | 100 | 35/30 | 23300 |
| 3 | Bore wells in hard rocks | BW | - | - | - | 150-160 | 80 | 20600 |
| 4 | Alluvium | FP | - | - | - | 100 | 15 | 4500 |
| 5 | Development of old well | DOW* | - | - | - | - | - | 5000 |

* Deepening 2 m from 10 to 12 m.

## 4.2 Water Conservation and Artificial Recharge

For ground water conservation and artificial recharge, a number of structures have been taken since 1995 under the control of District Water Management Agency in a big way in the district under DPAP, IWDP, RIDF, APRLP,EAS, NEERU MEERU and other programmes in the non-command area.The structures, under these Schemes are check dams, percolation tanks, farm ponds,

contour bunding and trenches, feeder channel and gully control etc. The forest department also carried out and contour trenching works. So far, as many as 509 structures have been completed and 351 structures are under execution.

The artificial recharge structures must be taken up in non-command area, particularly in the critical and over exploited mandals for the benefit of farmers. As per the geomorphic conditions prevailing, the most suitable recharge structure is percolation tanks. In addition, check dams, gully controls and bunding may be taken up where considerable gradient and length of slope is available. All the works have to be on water shed basis, after careful study of the micro-basin parameters, surface run off and after meeting the needs of the existing structures. Roof top harvesting in urban and rural areas should be made mandatory to enhance groundwater recharge. Area recommended for artificial recharge to ground water is presented in **Fig.8.**

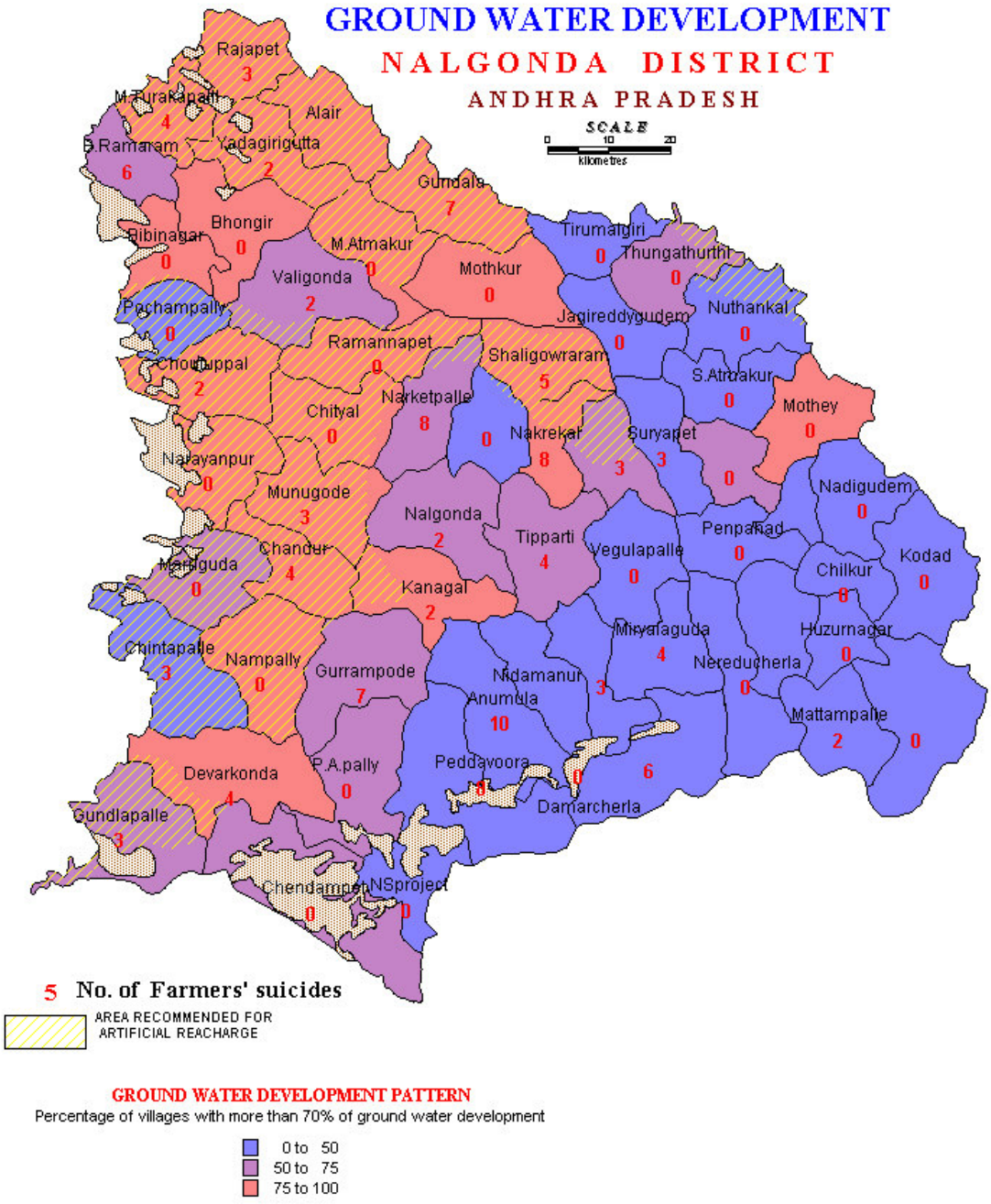
## 5. RECOMMENDATIONS

According to official sources and personal interaction with farmers across the district, as mentioned in the foregoing discussions, it has come to light that the distress situation of the farmers is reportedly due to he causes of indebtedness, Due to the unsteady supply of power, burning of motor pumps, wrong selection of crops, spurious seeds, scarce water resources leading to crop failures etc, pushing the farmers into heavy pecuniary losses.

The high input costs and non-remunerative market rates for the agricultural produce are the other reasons for the farmers' distress.

The above problems can be addressed to maximum extent by observing the groundwater management techniques and other remedial measures as mentioned below.

Fig. - 8


GROUND WATER DEVELOPMENT
NALGONDA DISTRICT
ANDHRA PRADESH
SCALE
0 10 20
Kilometres
Rajapet 3
M.Turakapalli 4
Alair
B.Ramaram 6
Yadagirigutta 2
Gundala 7
Bhongir 0
Bibinagar 0
M.Atmakur 0
Valigonda 2
Mothkur 0
Pochampally 0
Ramannapet 0
Choutuppal 2
Shaligowraram 5
Narketpalle 8
Chityal 0
Nakrekal 8
Nalgonda 2
Munugode 3
Chandur 4
Marriguda 0
Kanagal 2
Tipparti 4
Tirumalgiri 0
Thungathurthi 0
Jagireddygudem 0
Nuthankal 0
S.Atmakur 0
Mothey 0
Suryapet 3
Penpahad 0
Nadigudem 0
Vegulapalle 0
Kodad 0
Chilkur 8
Miryalaguda 4
Huzurnagar 0
Nereducherla 0
Mattampalle 2
Chintapalle 3
Nampally 0
Gurrampode 7
Ndamanur 3
Anumula 10
Devarkonda 4
P.A.pally 0
Peddavoora 0
Damarcherla 6
Gundlapalle 3
Chendampet 0
NSproject 0
5 No. of Farmers' suicides
AREA RECOMMENDED FOR ARTIFICIAL REACHARGE
GROUND WATER DEVELOPMENT PATTERN
Percentage of villages with more than 70% of ground water development
0 to 50
50 to 75
75 to 100

In non-command area, where further development of groundwater is possible the farmer must take professional advice regarding selection of bore well sites and depth of well on geophysical and hydro-geological studies. There is a wrong notion that more depth of a well will yield more water.

Groundwater conservation and artificial recharge structures must be taken up, based on scientific lines, to arrest surface run off in order to enhance the groundwater storage so as to make the existing bore wells sustainable.

The spacing norms of 250m distance between two adjacent bore wells shall be observed to achieve this the norms of APWALTA act shall strictly be implemented.

In non-command area where groundwater resources are scarce, less water intensive crops be raised and alternative modern irrigation methods like drip irrigation, sprinkler irrigation may be encouraged and farmers may be given loans with enhanced subsidy for its purchase and maintenance.

In the command area, especially in headwater reaches, conjunctive use of groundwater and surface water must be encouraged for irrigation purpose to enhance yield potential and at the same time improving the water quality and minimizing the water logging threat. The tail-end farmers are also benefited with more canal supply, fulfilling the concept of equitable distribution.

The authorities for optimum use of surface and groundwater must adopt watershed wise water management plans.

Mass awareness programmes must widely be conducted on regular basis in the ‘rural’ areas to educate the farmers regarding the water management to update their knowledge. Training for local government functionaries, NGOs, voluntary

organizations engaged in watershed development activity are to be trained in scientific techniques in the selection of sites, design of structures, etc. for construction of rainwater harvesting and artificial recharge structures.

There should be a complete institutional credit cover to the small and marginal farmers for drilling deep bore wells in the scientifically identified ground water potential zones, 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.

To minimize the dependence solely on agriculture the government should provide loan facility with enhanced subsidy to the farmers to initiate dairy and poultry for supplementary income for his subsistence.

In order to impart education to the farmers, regarding the cropping pattern, hybrid varieties, pesticides, irrigation techniques etc., 'Agri-clinics' may be established in rural areas for every five villages in non-command areas.

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