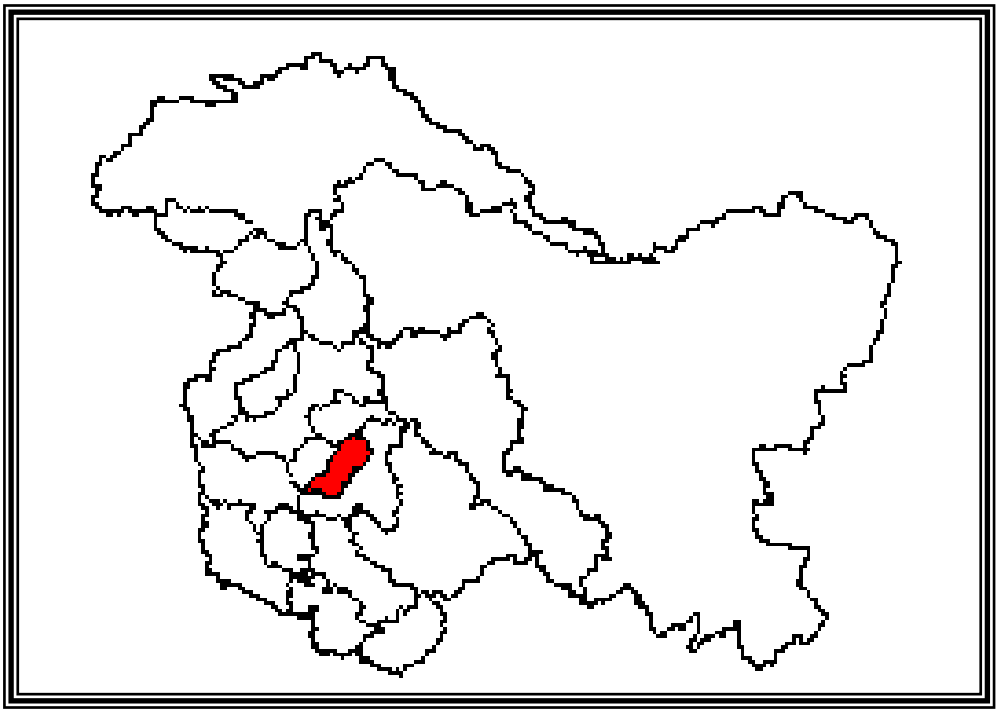
GOVERNMENT OF INDIA
Ministry Of Water Resources

CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET

PULWAMA DISTRICT, JAMMU & KASHMIR



NORTHERN WESTERN HIMALAYA REGION
JAMMU

JULY 2009

GROUND WATER INFORMATION BOOKLET

PULWAMA DISTRICT, JAMMU & KASHMIR

CONTENTS

PULWAMA DISTRICT AT A GLANCE

S. N.	ITEMS	STATISTICS
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	1,398
	ii) Administrative Divisions (2001) • Number of Tehsil & Sub-tehsils • Number of CD Blocks • Number of Panchayats • Number of Villages Inhabited Un-inhabited	 4 6 236 546 536 10
	iii) Population (2001 Census) • Total population • Population Density (person/sq km) • Muslim & others Population • Sex Ratio	 6,52,607 persons 467 95.88% & 4.12% 944
	iv) Average Annual Rainfall (mm)	1,040 mm
2.	GEOMORPHOLOGY	
	Major Physiographic units	• High Karewa Plateau lands • Sharp ridges of hard rock • Intervening valleys & River Terraces
	Average Height	1,600 m amsl
	Major Drainages • Indus Basin • Jhelum Sub-Basin	Jhelum, Rembiari, Romushi, Sasara rivers
3.	LAND USE (2006-07) sq.km *(Source- Digest of Statistics 2007)*	
	• Forest area • Gross Irrigated area • Net Irrigated area • Gross area sown • Net area sown • Horticulture Area	810 581.42 359.01 830.29 530.35 353.38
4.	MAJOR SOIL TYPES	• Soils developed on Karewa tops and upland areas are medium to fine textured and known as Hapludalf • Soils found on plains are clay loam in nature and are dark brown

S. N.	ITEMS	STATISTICS
5.	IRRIGATION BY DIFFERENT SOURCES *(Source- Digest of Statistics 2007)*	
	• Dug wells & shallow TW • Surface water(Canals) • Springs/Tanks • Others	*Net Area (sq.km.)* 1.15 351.36 5.21 1.29
6.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (Monitored up to 1989) • No. of Dug Wells • No. of Piezometers	 07 Nil
7.	PREDOMINANT GEOLOGICAL FORMATIONS	Quaternary Alluvium Karewa formations Older Metamorphics
8.	HYDROGEOLOGY	
	Major Water Bearing Formations	
	1. Unconsolidated layered formations- (Karewa formations – both upper and Lower Karewas)	Covering (25%)
	• Yield prospects • GW structures	Low to Moderate (10-20 lps) Handpumps, Dugwells & Tubewells
	2. Unconsolidated porous sediments (Alluvium)	Intermountain small valleys and main Kashmir Valley area (50%)
	• Yield prospects • GW structures	Low to Moderate (10-55 lps) Handpumps, Dugwells & Tubewells
	3. Consolidated Formations/ Hard Rocks (Panjal Traps, Dogra slates, Zewan beds / Gondwana formations)	Covering about 25% of the district
	• Yield prospects • GW structures	Very Low (<2 lps) Springs & Dugwells
	Average Depth to water level • May • November	 4.00 m bgl 3.00 m bgl
9	GROUND WATER EXPLORATION BY CGWB (As on 31.12.2008)	
	• No of wells drilled	21 EW
	• Depth Range (m)	40.0 to 306.0
	• Discharge (lps)	5.0 to 50. 0
	• Transmissivity (m^2/day)	63.0 to 100.0

S. N.	ITEMS	STATISTICS
10	GROUND WATER QUALITY	
	• Presence of Chemical constituents more than permissible limits (eg. EC, F, As, Fe)	Fe is present more than permissible limits in pockets
11	DYNAMIC GROUND WATER RESOURCES (2004) in MCM (valley area only)	
	• Annual Replenish able Ground Water Resources	275.62
	• Net Annual Ground Water Draft	0.53
	• Projected Demand for Domestic and industrial uses up to 2025	36.91
	• Stage of Ground Water Development	8.38% Safe
12	AWARENESS AND TRAINING ACTIVITY	
	• Mass Awareness Programmes	Nil
	• Water Management Training Programmes	Nil
13	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	Nil
14	GROUND WATER CONTROL AND REGULATION	
	• Number of OE Blocks	Nil
	• No of Critical Blocks	Nil
	• No of blocks notified	Nil
15	MAJOR GROUND WATER PROBLEMS AND ISSUES	
	• Quality Problem	Presence of high Iron content is the main hazard.

GROUND WATER INFORMATION BOOKLET

PULWAMA DISTRICT, JAMMU & KASHMIR

1.0 INTRODUCTION

Pulwama district is one of the six districts of Kashmir province. The district with its head quarters at Pulwama lies in the southern part of Kashmir valley and is located between $33^0$30'00" and $34^0$05'00" North latitude and between $74^0$05'00'' and $75^0$01'00'' East longitude and is covered by SOI Degree sheet no. 43 J, K, N, O. The district is bounded by Budgam district in the west, Srinagar district in the north and Anantnag district in the south and east. The district is approachable by National High way that passes through the district in the central part.

The district has a total geographical area of 1,398 sq km, comprising of 546 villages (536 inhabited and 10 un-inhabited villages). Administratively, the district is divided into 04 *tehsils* (Pulwama, Pampore, Shopian, Tral) and 06 blocks (Pulwama, Pampore, Shopian, Tral, Kakapora, Kellar)

As per 2001 census, the district has a population of 6,52,607 persons, with population density of 467 persons per sq. kms. The male and female population in the district is 3,35,544 and 3,17,063 respectively with a male / female sex ratio of 944. The schedule caste population in the district is 97 persons i.e. 0.001% of the total population and scheduled tribe population is 24,496 i.e. 3.75% of the total population. The district has recorded population growth of rate 27.73% during the decade 1991-2001 as compared to 29.04% at state level.

The main sources of are canals and an area of 58,142 hectares is brought under irrigation by various sources like canals, tanks, wells and other sources. A sizeable part of the cultivated area of the district is not having the assured irrigation facilities and the agriculturists have to depend on the vagaries of weather.

Central Ground Water Board has carried out extensive hydro geological studies both by conventional and non-conventional methods in the district. Under Ground Water Exploration, 21 exploratory wells have been drilled ranging in depth from 40 mts to 306 mts. CGWB has been monitoring 7 NHS (National Hydrograph Stations) till 1989 where ground water levels, fluctuations and quality was monitored. At present 6 NHS are being monitored

2.0 CLIMATE AND RAINFALL

The climate of the district is Temperate cum Mediterranean type. In the higher reaches the temperature remains cold through out the year. Average minimum and maximum temperature varies from –5°C to 32°C. The winter season starts from the middle of the November and severe winter conditions continues till the middle of February/March.
The district receives an average annual precipitation of about 1,040 mm in the form of rain and snow for about 60 days.

3.0 GEOMORPHOLOGY AND SOILS

Pulwama district is hilly and mountainous towards the northeast and southwest with broad intermountain valley. The altitude of the hill ranges up to 3700 m amsl. The Valley area in the central part of the district has flat to mildly undulating topography with its elevation about 1600 m amsl and has an area about 6,000 sq. km. The Master slope in the area is towards north west.

The district forms part of the Jhelum sub basin of Indus basin. River Jhelum is the major rivers with its tributaries drain the area. Three major tributaries of River Jhelum Viz., Sasara, Rembaira and Romushi rivers drains the sloping land in the southwest and have wide channels.

Soil in hilly areas is poor and fertile in plain areas. Productivity in higher ranges is poor while in central regions is fertile.

4.0 GROUND WATER SCENARIO

4.1 GEOLOGY

The rock formations underlying the district ranges in age from Cambrian to Quaternary. The brief generalized geological succession in the district is given below

Stratigraphic Unit	*Lithology*	*Thickness (m)*	*App. Age*
Alluvium	Clay, Silt and sand	15	Recent
Upper Karewas	Alternate greenish sandy and grey clay bed layers with calcareous Laminae	750	Plio-Pliestocene
	Second fluvio-glacial boulder bed	130	
Lower Karewa	Clay (bluish grey) & Conglomerates with coarse to fine sand (greenish in colour) alternate with grey sandy clays. *Lignite and peat material*	2000	Plio- Pleistocene
	First fluvio-glacial Boulder bed	200	
Panjal Trap	Agglomeratic slates, grits and effusive rocks		Permo-Carboniferous
Zewan beds	Shale, slates with quartzite and limestone.		Cambro-Silurian

Zewan beds, Panjal traps forming hilly and mountainous terrain of the district with hard formations of igneous and metamorphic rocks. The Karewas and alluvium of Quaternary and Tertiary age (Plio-Pleistocene) underlie the valley area and consists of alternate bands of sand, silt, gravel & clay, interspersed at two to three levels locally by glacial boulder beds. This formation is important from ground water point of view and sustains the water supply system in the area. This formation of Plio-Pleistocene age lies dis-conformably over the older rocks ranging in age from Cambrian to Triassic.

4.2 HYDROGEOLOGY

Hydro-geologically, the district is divided into two distinct and well-defined aquifer systems, viz., *hard rock or fissured aquifer* constituted mainly by semi-consolidated to consolidated rock units and *soft sedimentary or porous aquifer* constituted mainly by unconsolidated sediments.

The fissured formation includes the semi-consolidated to consolidated rock formations exposed in the district are of igneous, metamorphic and sedimentary origin. These forms low and high hill ranges through out the district. Fractured and jointed igneous, metamorphic rocks and the scree/talus deposits in the foothills form low to moderate potential aquifers with poor to moderate yields. Occurrence and movement of the ground water is mainly controlled by secondary porosity originated due to fracturing and faulting and related tectonic disturbances and weathering. Ground water oozes in the form of springs, seepages in the hilly areas and is utilizing for domestic purposes. There are numerous springs in the district generally concentrated along the contact zones and also in the hilly area. At some places shallow hand pumps and tube wells are constructed for ground water development. The yield of the shallow tube wells and hand pumps constructed along these secondary porous zones varies from 3-35 m^3/hr.

The unconsolidated sediments comprising of fluvio-glacial and lacustrine deposits of Karewas and recent alluvium, terrace deposits and alluvial fan deposits constitute the porous aquifer system of the district. The sediments consist of sand, gravel, cobbles, pebbles, boulders interlayered with thick clay beds forms the prolific aquifer system. Occurrence and movement of ground water is mainly controlled by the primary inter-granular porosity in the soft sedimentary comprising of Quaternary alluvium and the Karewa formations. This unconsolidated sedimentary deposit forms multi-layer major aquifer system in the area. The sedimentary formation is +300m thick in the district as revealed by the study and ground water exploration carried out by CGWB. Ground water in the district occurs in phreatic and confined conditions in these formations. The depth of the tube wells ranges from 40 m at Ratnipora to 306 m at New Karewa. The water table occurs under artesian conditions at some areas. The yield of the tube wells ranges from 300 lpm at Hayatpora to 2980 lpm at Khonmoh for drawdowns ranges from 25 m to 0.41 m respectively. The depth to water level ranges from 0.50 m agl (artesian free flowing) at Tahab to 44.24 m at Hayatpora. The transmissivity values ranges from 63 m^2/day to 100 m^2/ day.

4.3 DEPTH TO WATER LEVEL

The water level from the national network of hydrograph stations (7 no) set up in the valley area of the district is available up to year 1989. A perusal of the data shows that in major part of the valley area the depth to water levels are shallow, less than 5 m bgl. The depth to water level however, ranges from 0.67at Parigam Jagir to 18.75 m bgl at Sadipora. In valley areas, open wells and tube wells are the main ground water withdrawal structures.

4.4 GROUND WATER RESOURCES

Precipitation in the form of rain and snow in the district is the major source of ground water recharge apart from the influent seepage from the perennial rivers, streams and

lakes, irrigated fields and inflow from upland areas. Discharge of ground water mainly takes place from wells, tube wells and effluent seepages of ground water in the form of springs and base flow in streams.
The Ground Water Resources for the district were computed in the year 2005 for valley areas only as per the GEC-1997 methodology and are given below

1	Total Geographical Area	Ha	1,39,800
2	Valley Area	Ha	1,05,000
3	Net Ground Water Availability	MCM	275.62
4	Ground water Draft For Irrigation	MCM	0.53
5	Allocation For Domestic & Industrial Use up to 2025	MCM	36.91
6	Net Ground Water Availability For Future Use	MCM	238.18
7	Stage of Ground Water Development	%	8.38

The stage of ground water development in the valley portions of the district is less than 10% and falls in the safe category. Thus, there is scope for further ground water development.

4.5 GROUND WATER QUALITY

CGWB monitors the quality of ground water of shallow aquifers through National Hydrograph Network Stations. In addition to these, water samples are collected during the scientific studies whenever taken up. The range of chemical parameters in the district is summarized below

S.No	**Parameter**		**Range**	
			Min	**Max**
1	pH		7.02	8.80
2	EC	µS/cm	145	1250
3	HCO_3	mg/l	85	384
4	Cl	mg/l	7.1	70
5	NO_3	mg/l	0.75	40
6	F	mg/l	0.05	0.65
7	Ca	mg/l	20	98
8	Mg	mg/l	6.1	50
9	Na	mg/l	1.0	108
10	K	mg/l	0.5	8.4
11	TH as $CaCO_3$	mg/l	90-	255
12	Fe	mg/l	0.10	3.0

Ground water quality in the district is generally good both for irrigation and domestic purposes. From the samples collected from ground water sources Viz., wells, tube wells, hand pumps and springs, it is observed that the EC in the GW is less than 1250 µS/cm at 25°C. However, in ground water or aquifer strata at deeper levels in (lower Karewa) at places contain methane gas that makes the water non-potable at times.

4.6 STATUS OF GROUND WATER DEVELOPMENT

Ground water development in the district is on moderate scale restricted to the valley portions. All the major irrigation and drinking water supplies depend on the tube wells, dug wells in addition to various water supply schemes based on rivers/Nallahs.

Public Health Engineering and Irrigation and Flood control departments are the nodal agencies in the state concerned with the water supplies for drinking and irrigation respectively. In hilly areas the supplies depends upon the springs and shallow tube wells and hand pumps. In valley portions these state departments drilled number of tube wells with the depth ranges from 50-100 meters, with discharges varies from 5 lps to 10 lps. Apart from the tube wells number of Hand pumps with the depth ranging from 30-60 mts depending upon the lithology of the area with a discharge varying from 0.5 lps to 2 lps. feeds the drinking water requirements of the district.

Central Ground Water Board had constructed 12 exploratory wells up to the year 1989. Exploratory activities again resumed during the AAPs of 2005-2006 and 2006-2007 under accelerated exploratory drilling programme and drilled 09 tube wells in the district. The depth of exploratory wells ranges from 50 m to 405 m with a discharge varying from 65 lpm to 2700 lpm.

5. GROUND WATER MANAEMENT STRATAGY

5.1 GROUND WATER DEVELOPMENT

Most of the population of the district is concentrated in valley portion drained by major river Jhelum and its tributaries. In the past, development of ground water was mainly through dug wells and percolation wells along the riverbeds, nallhas and also some springs has played a major role for sustainable domestic and irrigational purposes. In some of the areas, at present too these are the only sources of water.

However, in recent years modern means of ground water development have been employed. Public Health Engineering has been constructing number of hand pumps and shallow-moderate depth tube wells for large-scale water supplies.

5.2 WATER CONSERVATION AND ARTIFICIAL RECHARGE

Extraction of ground water through dug wells, hand pumps, tube wells, and the springs are the major sources of water supply to both rural and urban areas, but the availability of the water during summer is limited particularly in drought areas and requires immediate attention to augment this resources. Based on the climatic conditions, topography, hydrogeology of the area, suitable structure for rain water harvesting and artificial recharge to ground water is required. Roof top rainwater harvesting needed to be adopted in the urban areas and proper scientific intervention for spring development and revival is required in water scarce areas.

In the hilly areas roof top rainwater harvesting structures like storage tanks are recommended while in low hill ranges, check dams and roof top rainwater harvesting structures can be adapted.

6. GROUND WATER RELATED ISSUES AND PROBLEMS

The Karewas, which underlie the district, are deposited under fluvio-glacial and lacustrine conditions. Due to the deposition under the lacustrine environment, occurrence of methane gas is the common phenomenon in the various part of the district. The lateral and vertical extent of the sediments of Karewas varies and represents different hydro-geological set up. In the hard rock areas, the aquifers are discontinuous and localized and of different hydrogeological set up.

Some of the common issues are the occurrence of methane gas and accompanied silt, quality related problems particularly for 'Fe' and occurrence of silty aquifers and boulders for development of ground water. These ground water issues and problems are localized and need to be focused by taking micro level studies in a particular area.

7. AWARENESS AND TRAINING ACTIVITY

So far neither Mass Awareness Programme (MAP) nor Water Management Training Programme (WMTP) has been conducted by CGWB in the district.

8. AREAS NOTIFIED BY CGWA/SGWA

The stage of ground water development in the district is less than 10% only and falls in safe category. Thus, no area or block has been notified for ground water development.

9. RECOMMENDATIONS

- In valley areas, in addition to the traditional ground water structures like dug wells and springs, shallow to medium depth tube wells can be constructed for developing the ground water resources. Ground water resources can also be developed by constructing infiltration galleries (Percolation wells).

- In hilly terrain, springs and perennial nallahs are the major sources of water. Medium to shallow bore holes and hand pumps are useful ground water structures for meeting the domestic needs.

- Monitoring of water levels and chemical quality at representative areas is required to keep a watch on any adverse effect that ground water development may have in future.

- Traditional resources like springs need to be revived, developed & protected on scientific lines for various use. The discharge of such springs can be sustained by construction of small check dams or subsurface dykes across the nallahs/tributaries in the downstream at favourable locations.

- Small ponds/tanks can be utilized for recharging ground water. These structures can be constructed for harvesting water and utilized for both recharging and meeting the domestic needs.

- Roof top rainwater harvesting practices must be adopted in hilly areas since the district receives precipitation in the form of snow and rain.

- Rainwater harvesting in general & RTRWH in particular is an ideal solution for augmenting water resources particularly in sloppy hilly & chronic water scarce areas. There is thus need to create awareness for water conservation and augmentation and proper waste disposal for protecting water sources

- People's participation is a must for any type of developmental activities. So they should be made aware for proper utilization and conservation of water resources available. In addition, micro level efforts are required for proper implementation of development programme.

Plate-I

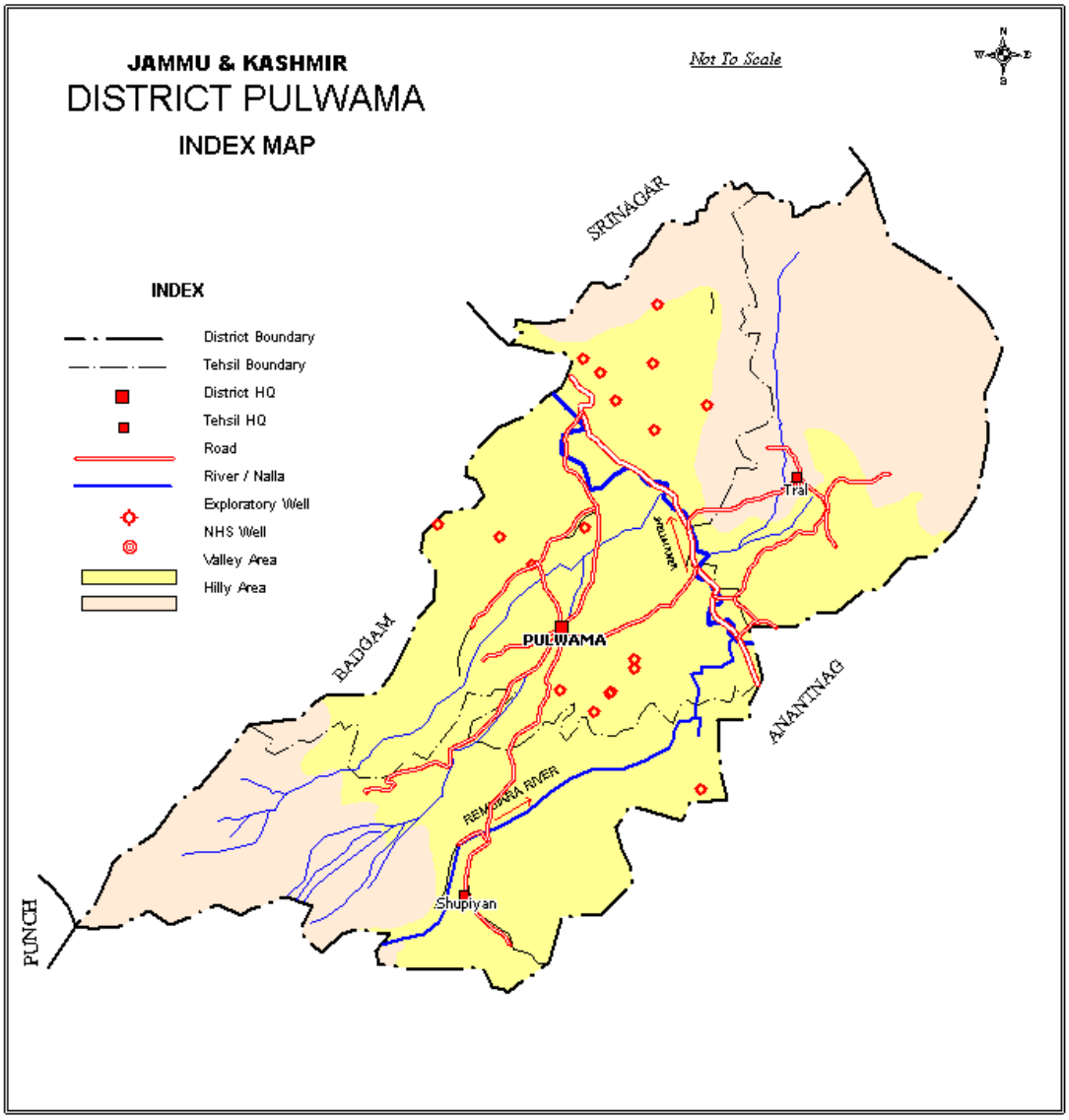

JAMMU & KASHMIR
DISTRICT PULWAMA
INDEX MAP
Not To Scale
INDEX
District Boundary
Tehsil Boundary
District HQ
Tehsil HQ
Road
River / Nalla
Exploratory Well
NHS Well
Valley Area
Hilly Area
SRINAGAR
BADGAM
PULWAMA
Tral
ANANTNAG
Shupiyan
PUNCH

Plate-II

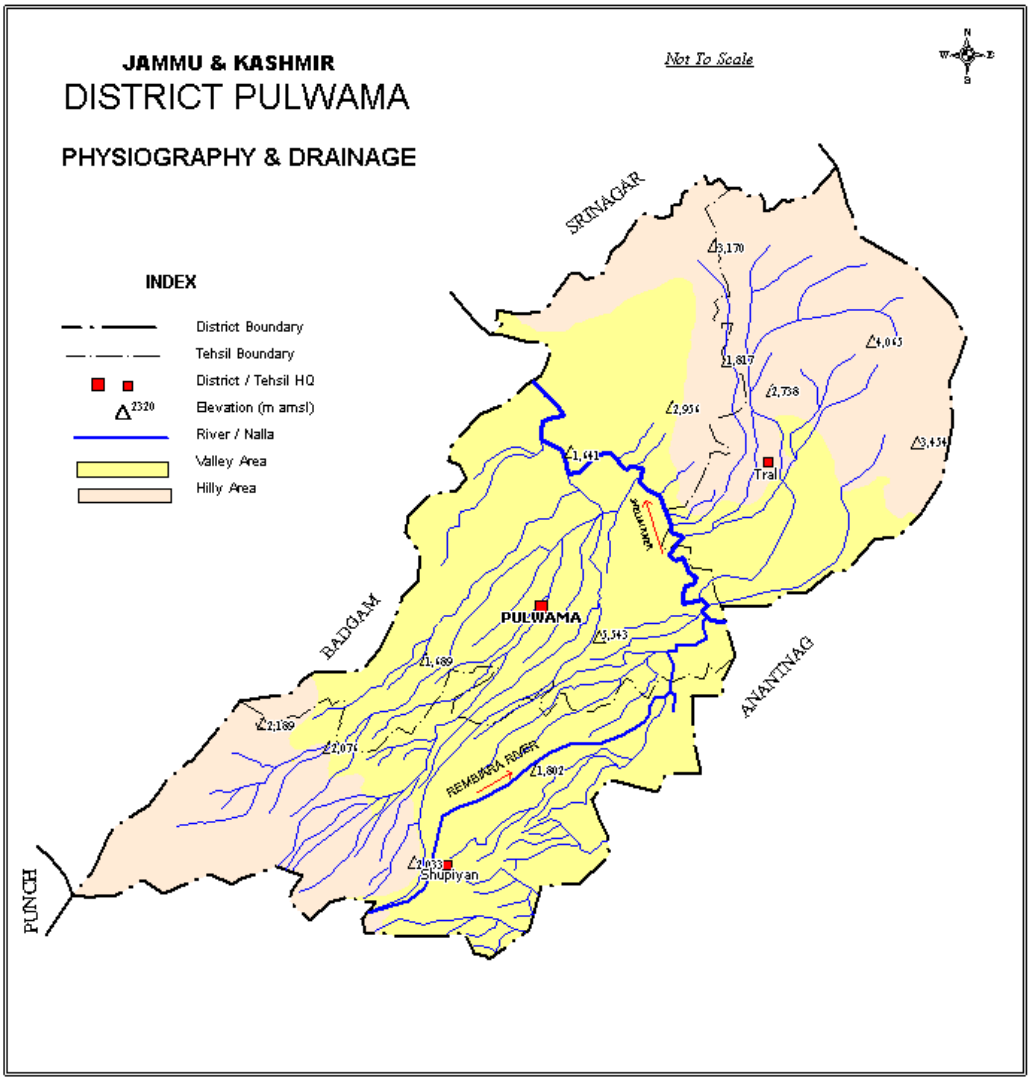

JAMMU & KASHMIR
DISTRICT PULWAMA
PHYSIOGRAPHY & DRAINAGE
Not To Scale
INDEX
District Boundary
Tehsil Boundary
District / Tehsil HQ
Elevation (m amsl)
River / Nalla
Valley Area
Hilly Area
SRINAGAR
BADGAM
PULWAMA
ANANTNAG
PUNCH
Tral
Shupiyan
RAMBIARA RIVER
3,170
4,045
2,738
3,434
2,189
1,802

Plate-III

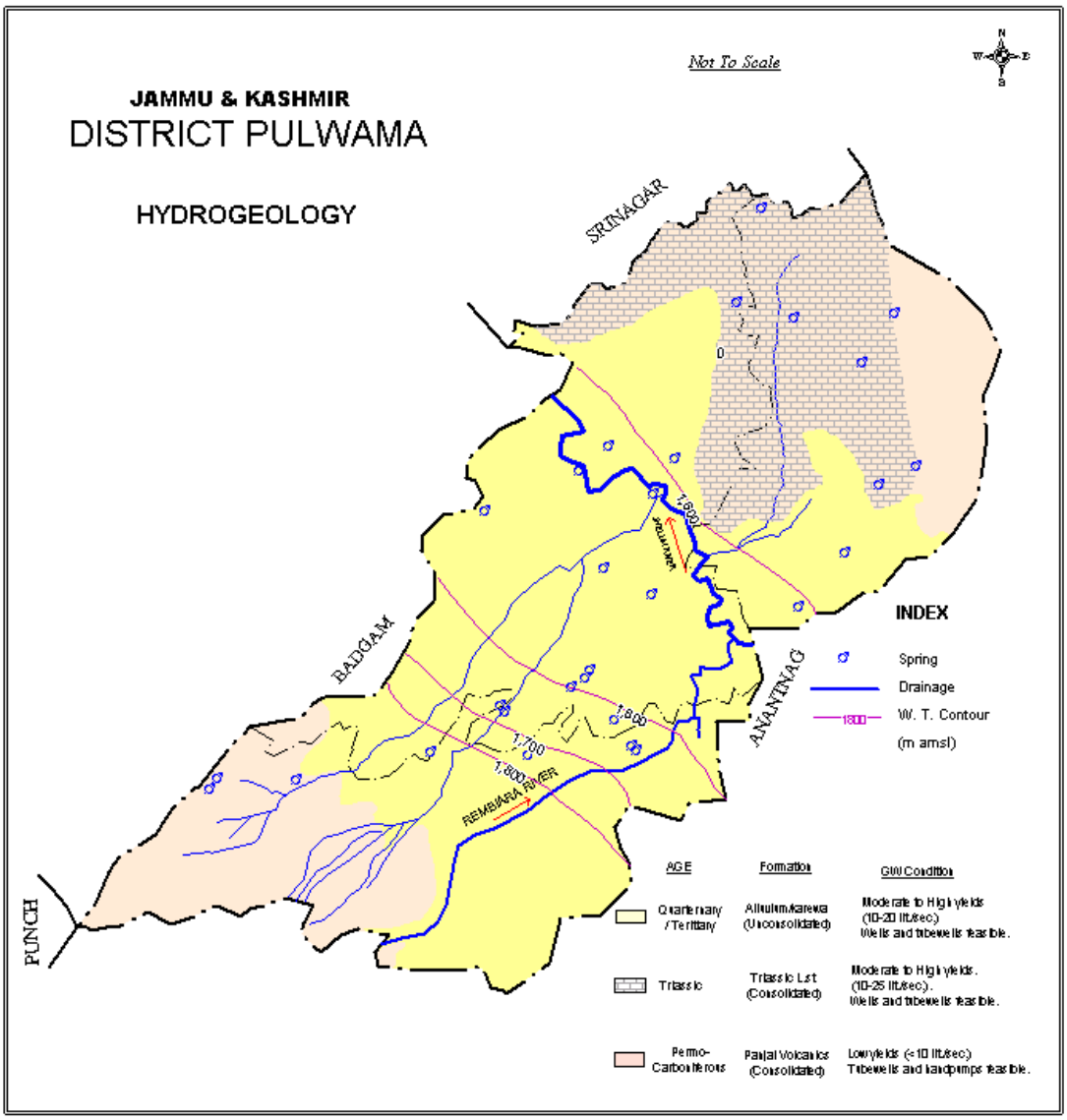
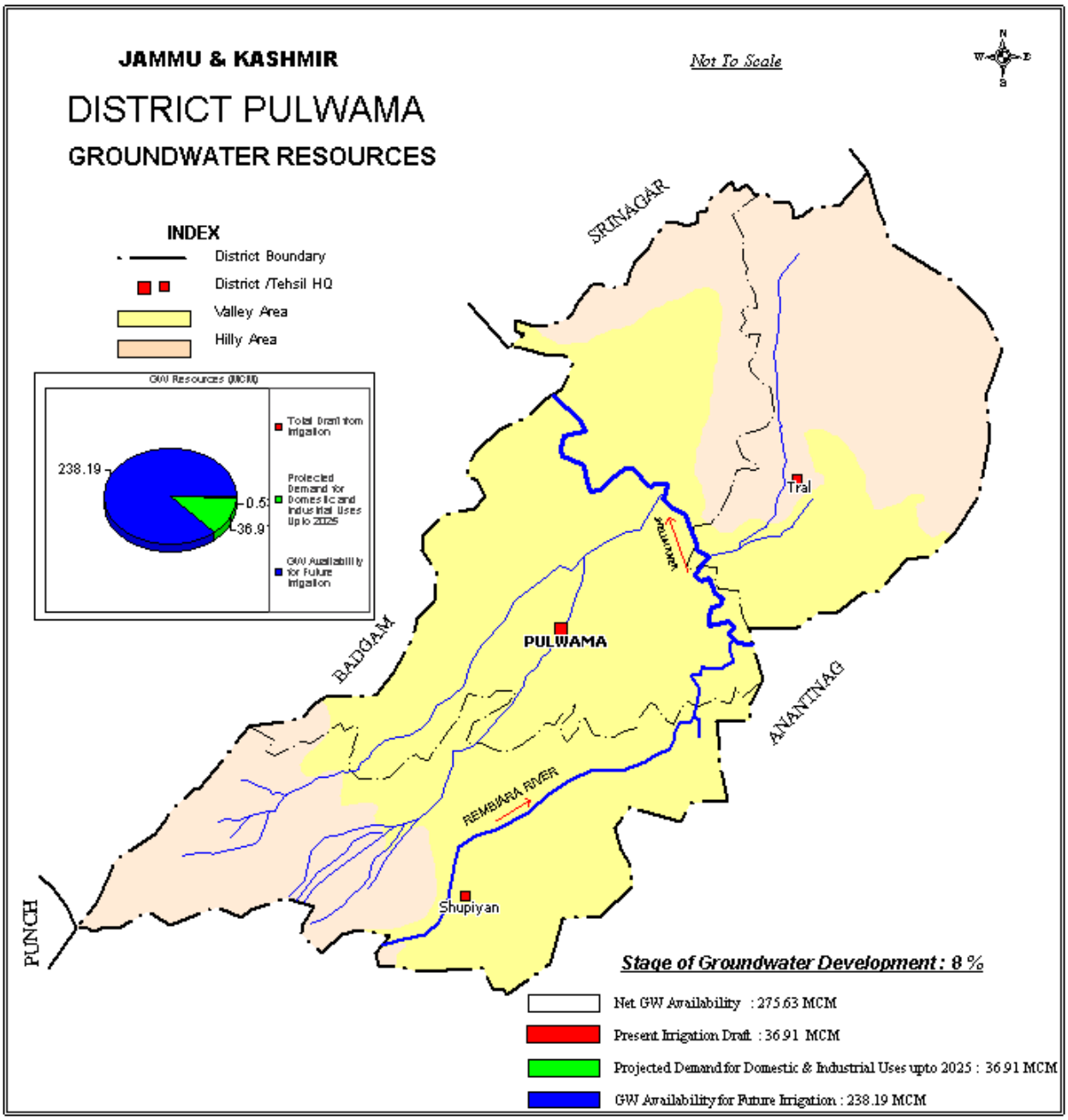
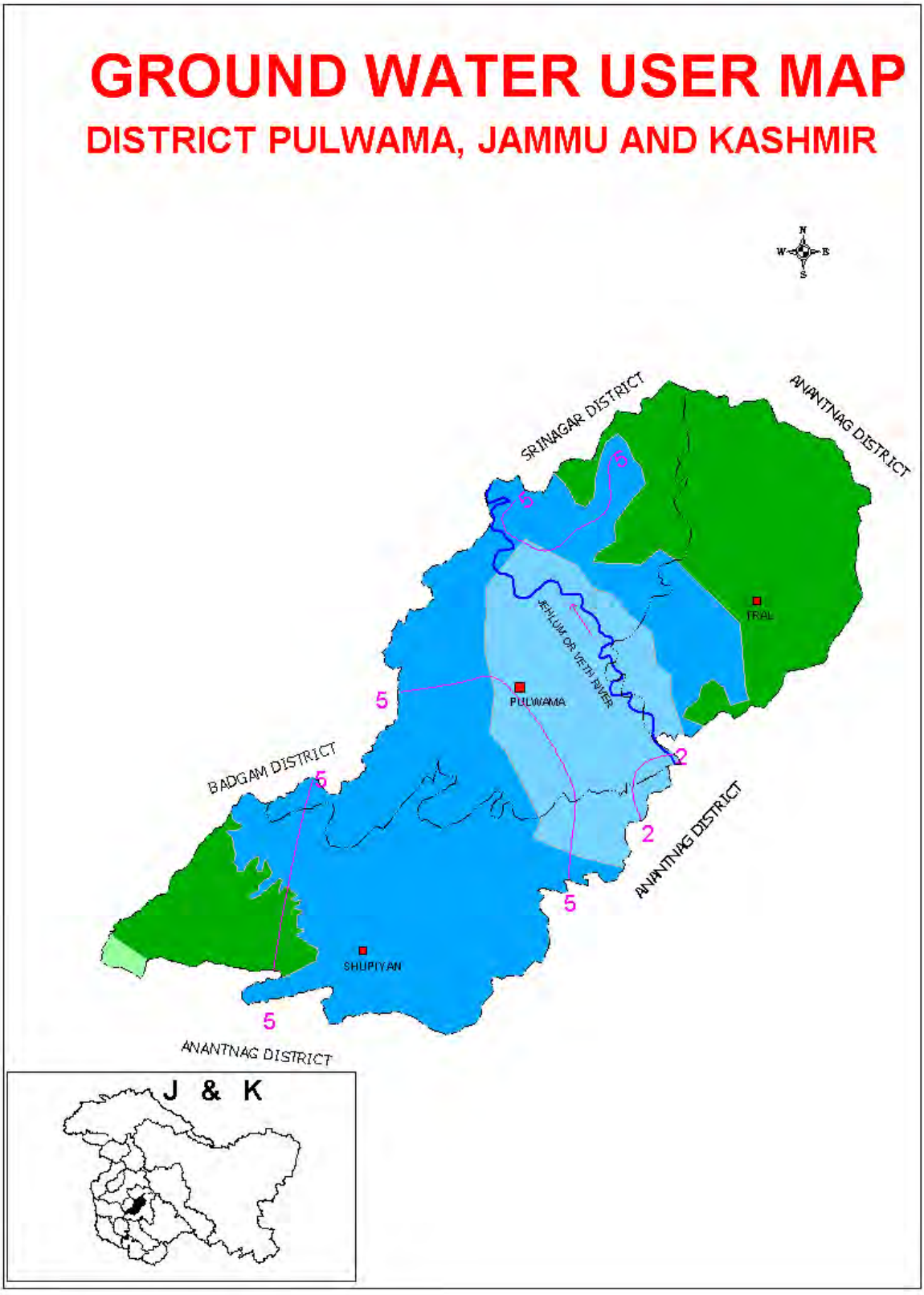

Not To Scale
JAMMU & KASHMIR
DISTRICT PULWAMA
HYDROGEOLOGY
SRINAGAR
BADGAM
PUNCH
ANANTNAG
JHELUM RIVER
REMBIARA RIVER
1,900
1,800
1,700
INDEX
Spring
Drainage
W. T. Contour
(m amsl)
AGE
Formation
GW Condition
Quaternary /Tertiary
Alluvium/Karewa (Unconsolidated)
Moderate to High yields (10-20 lit/sec). Wells and tubewells feasible.
Triassic
Triassic Lst (Consolidated)
Moderate to High yields. (10-25 lit/sec). Wells and tubewells feasible.
Permo-Carboniferous
Panjal Volcanics (Consolidated)
Low yields (<10 lit/sec) Tubewells and handpumps feasible.

Plate-IV


JAMMU & KASHMIR
Not To Scale
DISTRICT PULWAMA
GROUNDWATER RESOURCES
INDEX
District Boundary
District /Tehsil HQ
Valley Area
Hilly Area
GW Resources (MCM)
238.19
0.5
36.9
Total Draft from Irrigation
Projected Demand for Domestic and Industrial Uses Up to 2025
GW Availability for Future Irrigation
SRINAGAR
Tral
PULWAMA
BADGAM
ANANTNAG
REMBIARA RIVER
Shupiyan
PUNCH
Stage of Groundwater Development : 8 %
Net GW Availability : 275.63 MCM
Present Irrigation Draft : 36.91 MCM
Projected Demand for Domestic & Industrial Uses upto 2025 : 36.91 MCM
GW Availability for Future Irrigation : 238.19 MCM


GROUND WATER USER MAP
DISTRICT PULWAMA, JAMMU AND KASHMIR
N
W
E
S
SRINAGAR DISTRICT
ANANTNAG DISTRICT
TRAL
JEHLUM OR VEETH RIVER
PULWAMA
BADGAM DISTRICT
ANANTNAG DISTRICT
SHUPIYAN
ANANTNAG DISTRICT
5
5
5
5
2
2
J & K

LEGEND

DISTRICT PULWAMA

	Wells feasible	Rigs suitable	Depth of well (m)	Discharge (lpm)	Suitable artificial recharge structures
	Tube well	Percussion, Rotary, DTH with Odex	80 to 200✯	300 to 800	Check dam, Check Dam cum ground Water dam, Recharge Shaft/pit
Soft rock aquifers	Dug Well	Manual/Poclain	6 to 10	300 to 600	
Hard rock aquifers	Dug Well Spring Development	Manual/Poclain	6 to 10 m	300-400 30-1600	

5 Water level contour (m bgl) (Pre monsoon decadal mean, 1993-2002)

Springs

Tehsil boundary

District boundary

Major Drainage

Tehsil HQ

District HQ

OTHER INFORMATIONS

Total area	1398 sq.km
No. of tehsils	4
Major drainage	Jhelum, Rivers
Population	648762 (2001 Census)
Rainfall	1041 mm
Temperature	-4.9^0 C to 31.6^0 C
Regional geology	Soft rock : - Alluvium, Karewas
	Hard rock : - Panjal traps
Ground water quality	EC<750 micro mhos/cm at 25^{0}C
Utilizable ground water resources	262 mcm/yr
Stage of GW development	8 %
Name of watershed/ tehsil showing intensive GW development	Nil

Note : ✯ limited to explored depth

Areas with depth to water level > 8 m bgl are suitable for artificial recharge.

GROUND WATER INFORMATION BOOKLET
PULWAMA DISTRICT, JAMMU & KASHMIR STATE

CONTRIBUTORS

The Ground Water Information Booklet of Pulwama district of J & K State has been prepared by Sh. Ravi Kumar Gumma, Scientist 'B', North Western Himalayan Region, Jammu. This booklet has been scrutinized by Sh. S.K. Juneja, Scientist 'D' under the overall supervision and guidance of Sh. Arun Kumar, Regional Director, NWHR, Jammu.

The data generated in scientific studies carried out by various scientific officers and staff of the SUO Srinagar and NWHR, Jammu has been utilized in preparation of this booklet. The final scrutiny was done by Sh. R. C. Sharma, Sc-D,TS & OIC R&P Section. Ms Priya Kanwar, AHG has done lots of efforts in final processing and timely issuance of this booklet.

For Technical Assistance Relating to Rainwater Harvesting & Artificial Recharge to Ground Water

Contact:

CENTRAL GROUND WATER BOARD
STATE UNIT OFFICE
HOTEL HUMZA, OLD GAGRIBAL ROAD
SRINAGAR

Phone: **0194- 2108383**
Telefax: ***0191- 2451626***

e-mail: **rdnwhr-cgwb@nic.in**
tsnwhr-cgwb@nic.in

SAVE WATER SERVE HUMANITY